

Mining

CONGRESS JOURNAL



FEBRUARY
1953



ANNUAL MINING REVIEW



Link-Belt engineered throughout—National Mines' transfer house (left center), washery (top right), blending bins (background).

LINK-BELT's total responsibility is your assurance of the best in coal preparation

National Mines gets high-capacity, low cost per ton at Morgantown, W. Va.

TO PRODUCE coal economically from their Morgantown (W. Va.) mine, National Mines Corp. had a dual problem. Not only did they wish to produce a clean metallurgical coal—free of slate, rock and bone—but they also had to move the coal two miles to a river and rail loading station—through rough country—at lowest possible cost per ton.

Link-Belt handled both assignments from start to finish. The new washing and blending plant produces 216 tph of 4" x 0" clean, uniform coal. And the world's longest single belt conveyor carries the coal 10,900 ft. through a tunnel to the river, where Link-Belt also built the barge and rail loading station.

Large or small—Link-Belt accepts total responsibility for complete coal preparation plants. To get all the facts on how this single *proved* source can give you the finest in modern coal preparation—at the lowest over-all cost—call the Link-Belt office near you . . . today.



COAL PREPARATION and HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington 9, W. Va., Louisville 2, Denver 2, Kansas City 8, Mo., Cleveland 15, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Seattle 4, Toronto 8, Springs (South Africa).

13,028

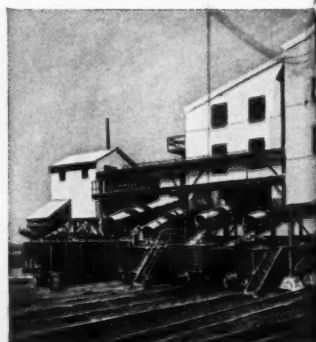
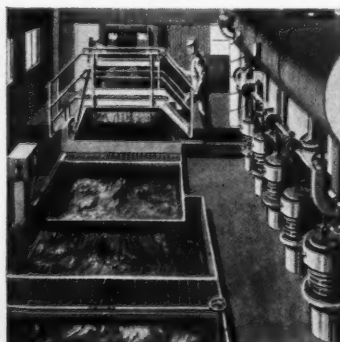
Here's what LINK-BELT's total responsibility means to you

OVERALL ENGINEERING. Vast experience of nation-wide design and field engineering staff integrates all factors, assures expert planning.

QUALITY EQUIPMENT. Link Belt itself builds a broad line of coal preparation, handling and power transmitting equipment.

COMPLETE ERECTION. Experienced erection superintendents, staffs and skilled crews carry through entire job down to last detail.

SATISFACTORY PERFORMANCE. When you rely on Link-Belt as a single source, Link-Belt accepts responsibility for overall operation.



6½-ton shuttle car rolls, steers and drives on TIMKEN® bearings

THIS Goodman Manufacturing Company type 580 shuttle car hauls as much as 6½ tons of coal at a time from mine face to mine entry. To insure against costly breakdowns in the mine and help the car stand up under the back-and-forth, day-after-day wear and tear of heavy-duty mine operations, Goodman uses Timken® tapered roller bearings on drives, steering knuckles, wheels and conveyor drives.

Timken bearings on the drives and steering knuckles carry both radial and thrust loads, holding shafts in

proper alignment. Drive gears mesh smoothly and accurately, gear wear minimized. Wheels roll easily, effortlessly. And steering's easier, reducing operator fatigue.

Line contact between the rollers and races of Timken bearings provides more than enough capacity for the heavy loads. True rolling motion and incredibly smooth surface finish of Timken bearings reduce friction, reduce wear.

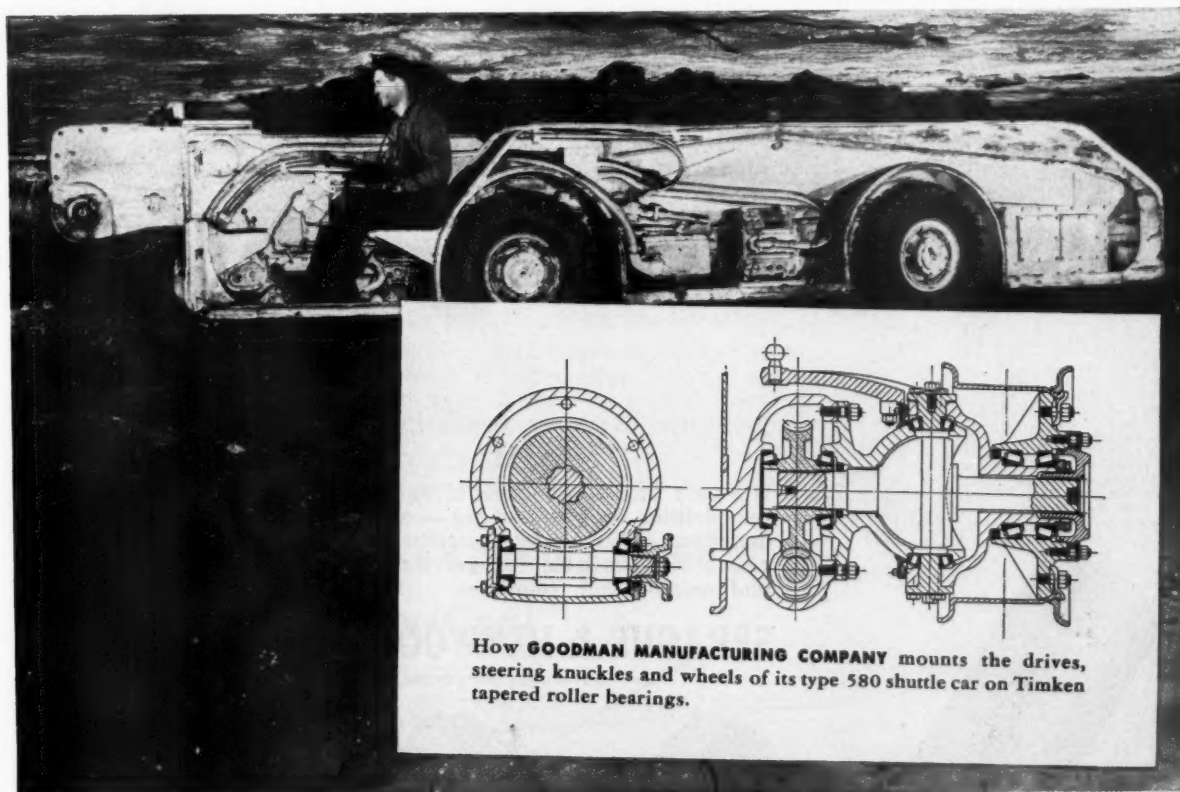
Because they hold shafts and housings concentric, Timken bearings make closures more effective. Dirt,

coal dust and moisture are kept out, lubricant kept in. Maintenance costs reduced.

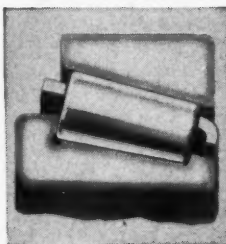
No other bearing can offer you all the advantages of Timken bearings. Be sure to specify them for the machines you build or buy. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



This symbol on a product means its bearings are the best.



How GOODMAN MANUFACTURING COMPANY mounts the drives, steering knuckles and wheels of its type 580 shuttle car on Timken tapered roller bearings.

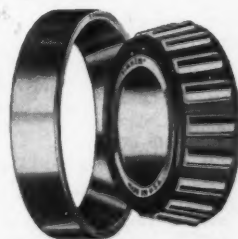


GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION



3
GRADES
OF
SELECTED
DIAMONDS

DOUBLE-TUBE REAMING SHELL

Available in all standard sizes for use with all types of double-tube corebarrels. Special sizes and types as required. Inserts are tough tungsten-alloy matrix set with carefully selected diamonds.



2
IMPROVED
TYPES OF
CAST-METAL
MATRICES

SINGLE-TUBE REAMING SHELL

Available in all standard sizes for use with all types of single-tube core barrels. Larger sizes and special designs as required. In order to fill orders promptly for either single- or double-tube reaming shells we must know the make and model of the core barrel.



2
MODERN
POWDERED
METAL
MATRICES



STANDARD CASING BIT

Available in all standard sizes with a choice of four different matrices and three different grades of selected diamonds. Larger sizes and special designs furnished as required. Must be removed before continuing to drill with core barrel and bit.



STANDARD CORING BIT

Available in four different matrices and three different grades of correctly-sized diamonds, EX, AX, BX and NX sizes carried in stock. Larger sizes and special designs furnished to meet any specifications or requirements.

IMPREGNATED CORING BIT

Especially suitable for drilling through hard, broken or extremely abrasive ground, where diamond loss from surface-set bits might be excessive. EX, AX, BX and NX sizes carried in stock. Larger sizes and special designs as required.



SERIES "M" CORING BIT

For use with Series "M" Double Tube Core-barrel as developed by Sprague & Henwood, Inc. to meet the need for a higher percentage of core recovery from soft, broken or friable material than can normally be obtained with a standard double-tube corebarrel. Available in all four types of matrix and three different grades of diamonds. Also in a complete range of "impregnated" type bits. EX, AX, BX and NX sizes carried in stock.



"CONCAVE" TYPE NON-CORING BIT

Especially suitable for drilling round smooth holes in relatively soft formations, when cores are not required. All standard sizes available in four different types of matrix.



"PILOT" TYPE NON-CORING BIT

Recommended for drilling blast holes in hard formations and also for use when long straight holes must be drilled in variable formations.



"TAPER" TYPE NON-CORING BIT

The fastest cutting bit for drilling blast holes in very hard formations. All standard sizes.

We KNOW What These Bits Can Do Because Our Own Drilling Crews Use Them

For more than sixty years Sprague & Henwood, Inc. has been a leader in the field of Contract Diamond Drilling and our crews—operating throughout the United States and many other countries—have constituted the best possible "laboratory" for proving the quality of Sprague & Henwood bits. They demand the best and we can't afford to give them anything less.

As manufacturers, therefore, we are in the highly advantageous position of KNOWING the relative value of every Sprague & Henwood bit for any given drilling condition, from the performance records of our own crews. And this valuable information is passed on to bit purchasers without charge or reservation.

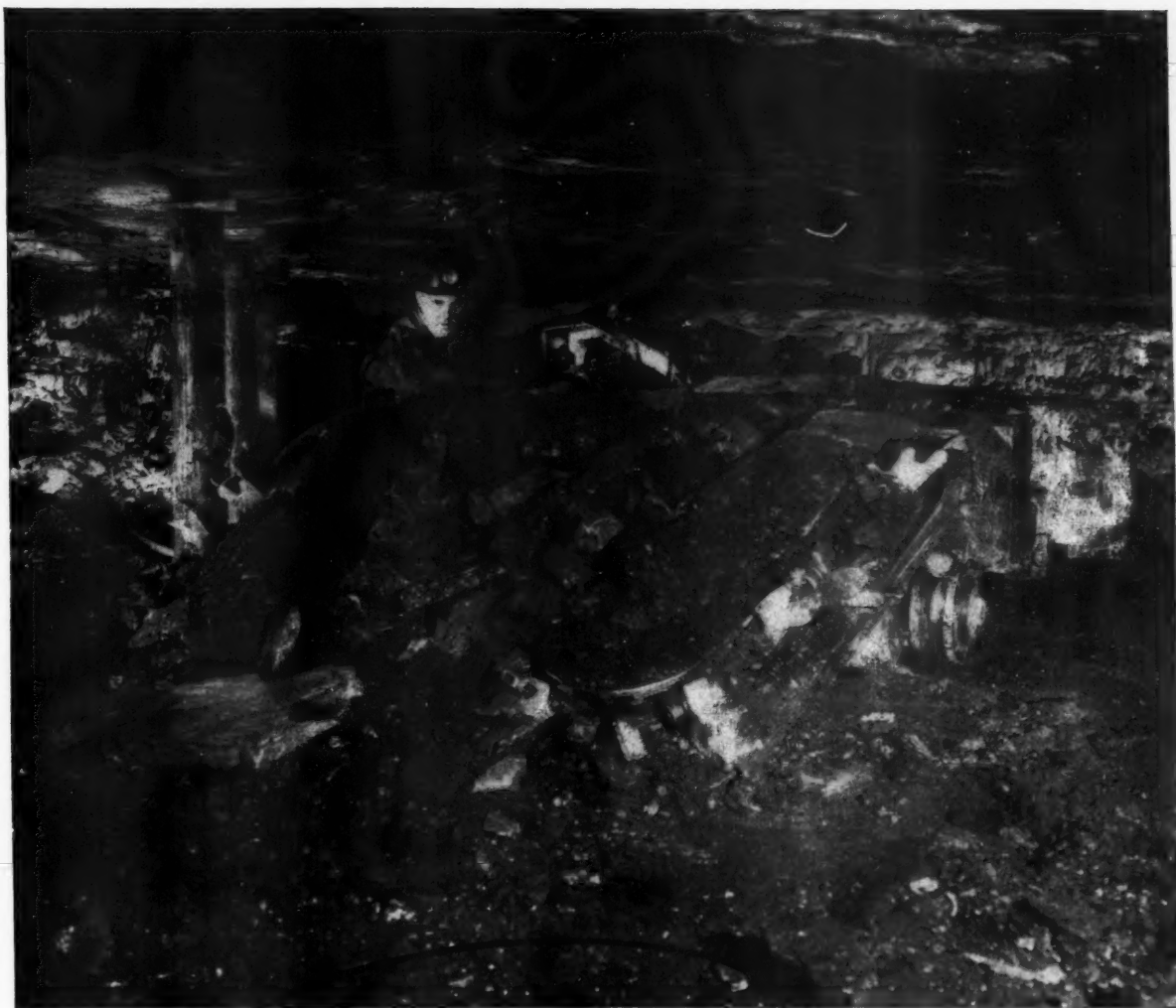
If you use diamond drilling bits we want you to have a free copy of our new Bulletin No. 320. Write for it today and tell us about your drilling conditions. Our experienced executives welcome opportunities to make money-saving recommendations.

CONTRACT CORE DRILLING

is a very important phase of our business. This includes exploratory drilling for coal and ore — also foundation testing for bridges, dams and other heavy structures. Experienced crews and supervisors are available for service anywhere in the United States and many other countries. Estimates submitted on request.

SPRAGUE & HENWOOD, INC. Scranton 2, Pa.

See our four-page insert in the McGraw-Hill Mining Catalogues



**High Capacity Loader
For Low Coal**

(Type 865)

designed and built by **GOODMAN MANUFACTURING COMPANY**
CHICAGO

Goodman builds mobile loaders of 3 heights for trackless mining. All feature free and easy side swing of loading head and discharge end that simplifies loading routine, means more productive loading time.

Goodman BUILDERS OF A COMPLETE LINE OF UNDERGROUND MINING MACHINERY

in shuttle car cable

there are no "lucky" breaks
—they all cost money!



... and four or five breaks can equal the cost of the cable in lost production. Since actual records show different makes have widely varying life expectancy, it pays to choose your cable carefully.



for longer "break-free" service insist on



Cold Rubber Insulated Securityflex

This ANACONDA portable power cable—the first with cold rubber insulation—won't override, kink or twist. New or aged, it has greater resistance to cutting, crushing, impact, abrasion, heat and moisture penetration than other types. It stands up well under reel tension, passes easily over guides, and won't fatigue readily from frequent sharp bends. Patented "anti-short" breaker strip and flat-stranded grounding wire make it the safest known cable for the job.

When cable repairs skyrocket costs so fast, it's poor economy to buy less than the best. A sample length of Securityflex* Shuttle Car Cable will convince you that this super-safe, super-tough cable can speed your production and cut down those "bad" breaks that leave your men and machinery idle too long. Call your nearest Anaconda Sales Office or Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

52358 *Trademark

the right cable for the job **ANACONDA®** wire and cable

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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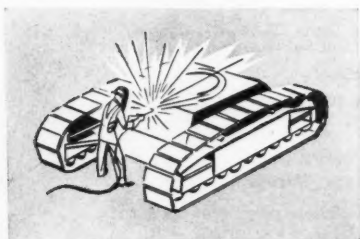
Before you buy:

SEE 'EM IN ACTION!



The owner of this LS-85 says "It's fast, rugged and easy to operate—service is negligible."

Rugged construction, work-speeding features help you keep production on schedule, costs in line



More live weight—All-welded construction plus proper weight distribution provides extra strength without dead weight...resists impact and twist...simplifies field service.

WHY are more Link-Belt Speeders being used for mining? Well, take the 30,000-lb. capacity, heavy duty $\frac{3}{4}$ yard LS-85 for example: It delivers 92 net hp at full load speed, has self-cleaning crawler treads, Independent Boom Hoist, and is outstanding for its stability. It is fast and maneuverable, yet takes heavy work with a minimum of maintenance.

Like the LS-85, every Link-Belt Speeder combines quality construction with superb design—speeds your work and earns more per equipment dollar. If you'd like details on this complete line of crawler, truck or wheel-mounted shovel-crane, see your distributor or write for catalog 2373.

LINK-BELT SPEEDER CORPORATION
Cedar Rapids, Iowa

19,087

LINK-BELT SPEEDER

CORPORATION

BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND
WHEEL-MOUNTED SHOVEL-CRANES

**FACTORY-TRAINED
DISTRIBUTOR SALES
AND SERVICE SPECIALISTS
...EVERYWHERE**



Most shock- and wear-resistant bits in the mining industry

Your mine can profit from the cutting and drilling efficiency of Kennametal Bits. Tough Kennametal tips stay sharp longer, take harder knocks than any other tungsten-carbide in the industry. Heat-treated, high-quality steel shanks give the Kennametal tips full support in severest cutting and drilling conditions.

Cutting and drilling is faster, there are fewer bit changes, power is saved, and machinery operates under less strain, be-

cause Kennametal Bits keep their hard cutting edges longer. Savings are made in parts replacement costs, power output, and maintenance expense.

Your Kennametal Representative is a man with years of actual mining experience. He'll be glad to suggest and demonstrate the right Kennametal Bit for your cutting or drilling operations. Get in touch with him today!

World's Largest Manufacturer of Tungsten-Carbide

Drill Bits, Cutter Bits, Roof Bits, Rock Bits, Strip Bits

KENNAMETAL®

KENNAMETAL INC., MINING TOOL DIVISION
BEDFORD, PA.

General Offices and Main Plant at Latrobe, Pa.

EAGLE-PICHER uses fleet of Allis-Chalmers tractor shovels to

Speed Underground

Eagle-Picher's constant search for new and better ways of mechanizing mining operations has led to the use of 20 Allis-Chalmers tractor shovels to speed underground loading at Tri-State Mines. In addition to this operation, Eagle-Picher has assigned these versatile TRACTO-SHOVELS to a wide variety of other jobs to increase production and reduce costs.

• here's what they do underground...

Loading ore directly into 15-ton hauling units after the ore face has been drilled and blasted.

Excavating—driving drifts through barren ground to reach new ore bodies.

Building and Maintaining all underground haul roads.

• and on the surface...

Loading and Hauling tailings, sand, gravel, silicon, lead and zinc ore, general supplies.

Digging drainage terraces, culverts, pond dams, railroad fills.

Setting and Placing drain tile, pipe, machinery.

Building and Maintaining parking lot and haul roads, cleaning up around hopper.

• new era of tractor usefulness

Today's mining needs require tractors that give high output and yet handle many different types of jobs. TRACTO-SHOVELS measure up to these new standards with performance advantages like these: big-capacity loading . . . excellent maneuverability and compact design for working in confined and low ceiling areas . . . standard electric starting of 2-cycle diesel engines meets necessary safety regulations for underground operation.

Your nearby Allis-Chalmers dealer can give you detailed information on all TRACTO-SHOVEL advantages. See him or phone him soon.

1-YD. HD-5G

2-YD. HD-9G

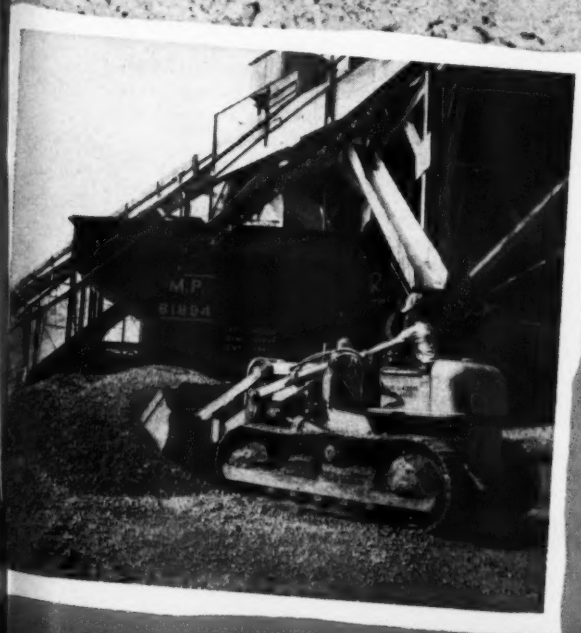
3-YD. HD-15G

4-YD. HD-20G

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A

Loading



UNDERGROUND

The 17 HD-5G's and 3 HD-9G's load ore into hauling units . . . excavate to reach new ore bodies . . . maintain all underground haul roads.

◀ SURFACE

HD-5G's haul and load lead and zinc ore, sand and gravel, other bulk material . . . dig drainage terraces, culverts, pond dams, railroad fills . . . build and maintain haul roads and clean up around hopper.

New American Tiger gives 20% to 83%

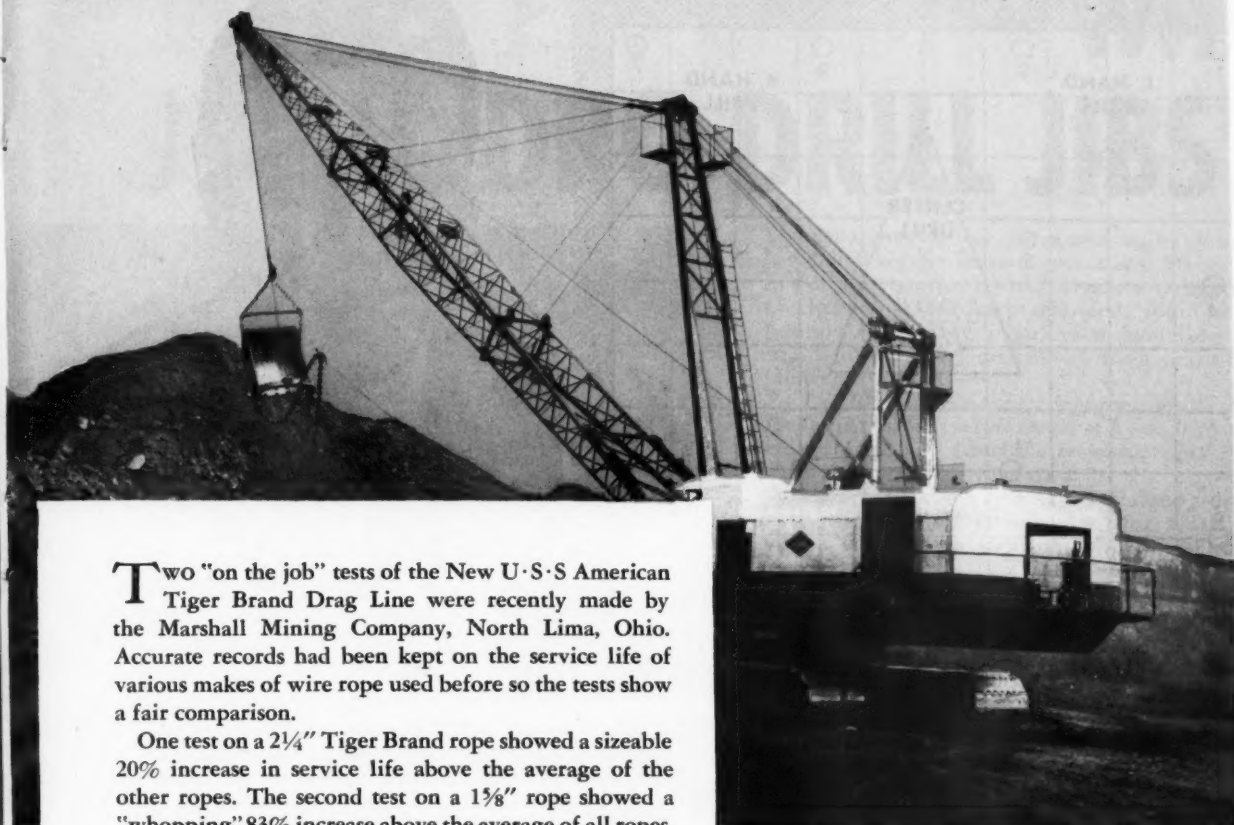


SAVES MONEY AND TIME—INCREASES PRODUCTION. This new Tiger Brand Drag Line Rope quickly pays for itself through increased life and greater production. Try it next time you have to replace your drag rope.

20% INCREASE IN WIRE ROPE LIFE. When this 14 cu. yd. drag line was equipped with the new Tiger Brand 2¼" Drag Line, the average service life of the rope was increased 20% over other brands tested.



Brand Drag Line increase in service life



Two "on the job" tests of the New U·S·S American Tiger Brand Drag Line were recently made by the Marshall Mining Company, North Lima, Ohio. Accurate records had been kept on the service life of various makes of wire rope used before so the tests show a fair comparison.

One test on a 2¼" Tiger Brand rope showed a sizeable 20% increase in service life above the average of the other ropes. The second test on a 1½" rope showed a "whopping" 83% increase above the average of all ropes. Digging conditions in all cases were the same.

This new Tiger Brand Drag Line was designed especially to resist the severe operating conditions imposed by this class of service.

The use of this new rope on your drag line will mean substantial savings in your wire rope costs. It will cut your down time and help to keep machines at top capacity.

DRAG LINE LIFE INCREASED FROM 600 HOURS TO 1100 HOURS—83%. The best service on this drag line using 1½" rope averaged 600 hours for other brands of rope. But with the new U·S·S Tiger Brand Rope, service life jumped to 1100 hours—almost double the previous average.

U·S·S AMERICAN TIGER BRAND WIRE ROPE

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

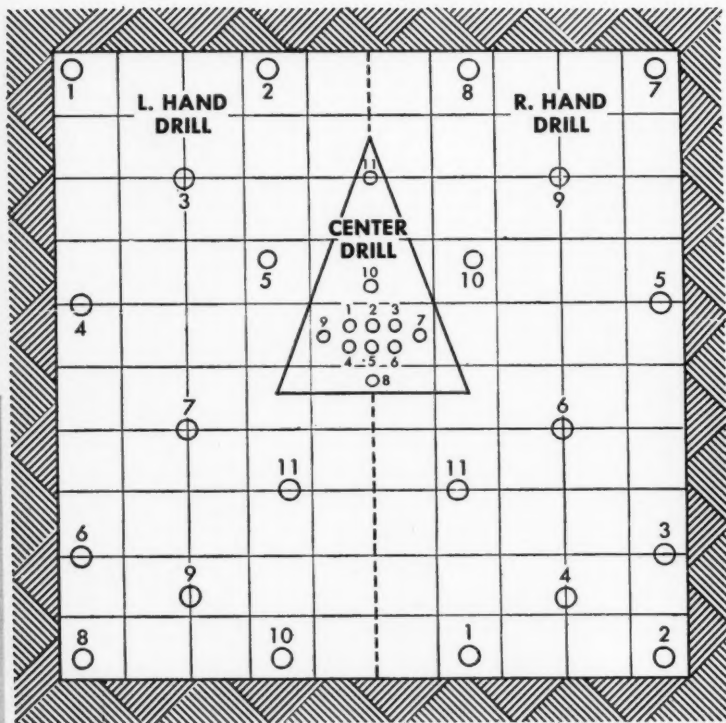
Excellent Preformed

UNITED STATES STEEL

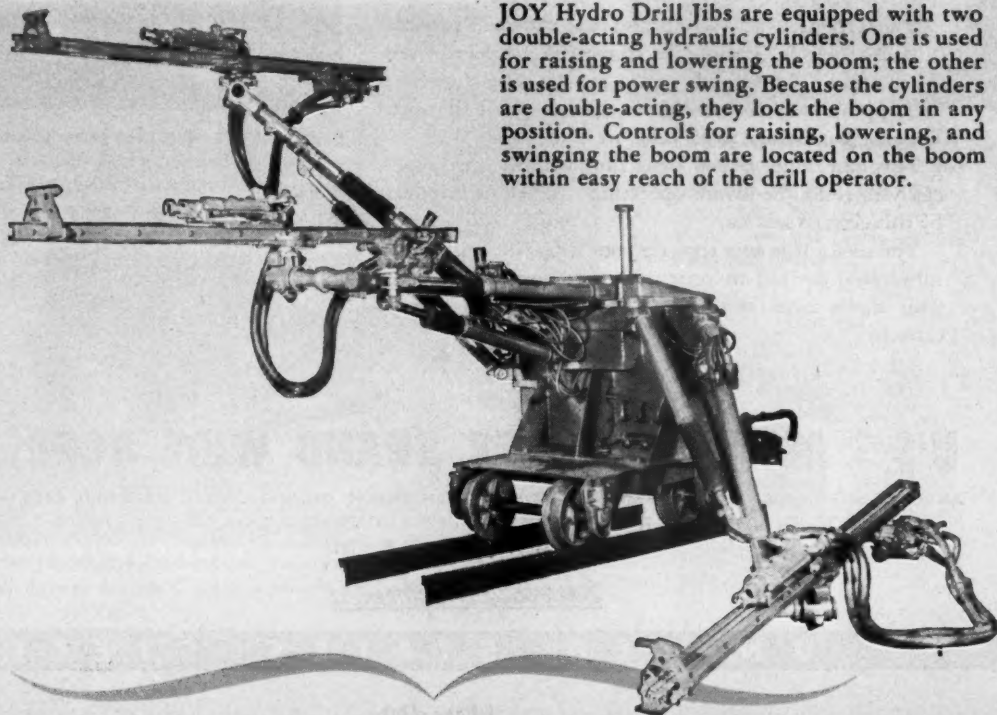


"DRILL OUT THIS ROUND"

said the Joy Engineer.



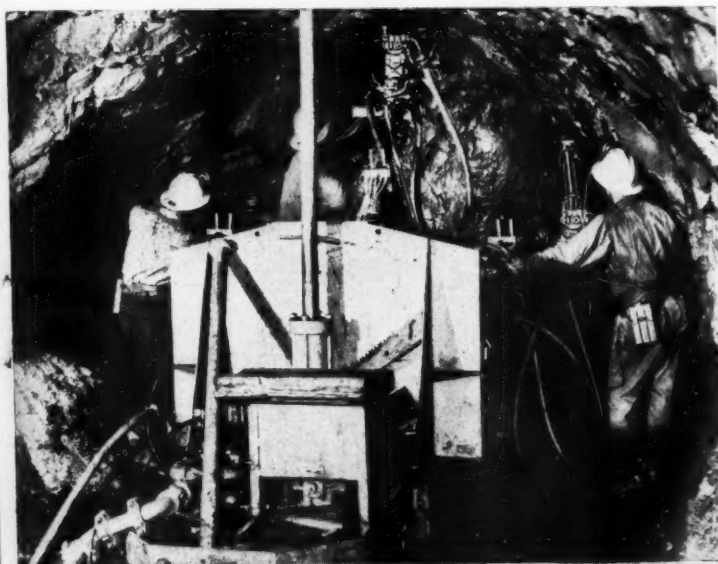
MAXIMUM VERTICAL RANGE WITH
VARIOUS LENGTH BOOMS: 10 to 14 FEET



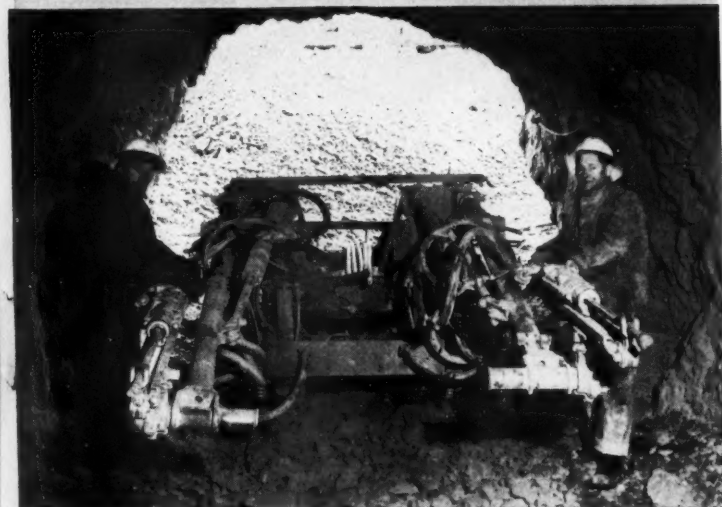
JOY Hydro Drill Jibs are equipped with two double-acting hydraulic cylinders. One is used for raising and lowering the boom; the other is used for power swing. Because the cylinders are double-acting, they lock the boom in any position. Controls for raising, lowering, and swinging the boom are located on the boom within easy reach of the drill operator.

MAXIMUM LATERAL RANGE WITH VARIOUS LENGTH BOOMS: 18 to 28 FEET

.. "IN RECORD TIME and WITH LESS EFFORT with JOY HYDRO DRILL JIBS"



On the job in a heading: a JOY Jib Jumbo mounting three Hydro Drill Jibs with JOY T-300 drifters.



JOY builds a complete line of Jib Jumbos and Drillmobiles. Above: a twin-boom JOY Drillmobile, rubber-tired and self-propelled for quick, easy mobility.

The recommendation above was made by one of Joy's drill mechanization specialists. He made it to a mining company which is now a satisfied user of the equipment recommended: four Joy Jib Jumbos (see facing page) each mounting three Joy T-300 Drifters on LW-6A long chain feeds. He went on to say—

"The LW 6A feed, easily supported by the Hydro Drill Jib, has an overall travel of 8 feet with a steel change of 6 feet. Thus, the proposed round can be drilled with one length of steel."

He then proposed and fully explained a drilling pattern (again see facing page) for a 10' x 10' round, showing the location of the eleven holes to be drilled by each one of the three jib-mounted drills. Basically, the plan provided for the least interference, and the maximum amount of drilling without dumping or swinging the drills. The holes for each drill were numbered so that the spreads between gave the runners plenty of working room. He closed by saying—

"The purpose of this proposal is to describe the many advantages of Joy fully automatic Hydro Drill Jibs. Joy pioneered the hydraulic drill jib and is still maintaining the lead in the design of this type of rig. We are keeping ahead with sound, practical improvements, and today believe we produce the finest drilling equipment available."

• Why not let a Joy drill mechanization specialist look over your problem and solve it the way he did this one? Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.



Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF
UNDERGROUND MINING EQUIPMENT

We'll Give You Better

ENGINEERING DATA

TYPES OF WEAVE: *Square Opening* available in Double Crimp—Lock Crimp—Flat Top . . . *Rectangular Opening* available in Double Crimp—Lock Crimp—Flat Top . . . *Non-Spreader . . . Non-Blind.*

TYPES OF WIRE: *Super-Gyraloy® Oil Tempered*—recommended for extremely abrasive materials such as coke, iron ore, stone, gravel and coal . . . *Gyraloy Spring Steel*—recommended where abrasion is present but not excessive, where initial cost is primary consideration . . . *Enamel Coated Gyraloy or Super-Gyraloy*—recommended for use in sizing and processing flue dust, ore, stone, coal, sand and gravel wherever corrosion causes cloth to blind . . . *Special Metals*—stainless, plain or galvanized steel; brass; phosphor bronze; Monel and other ductile metals.



HEWITT-ROBINS

DIVISIONS: HEWITT RUBBER • ROBINS CONVEYORS • ROBINS ENGINEERS • RESTFOAM®

Screen Cloth Delivery

Increased Production Capacity Assures Faster Delivery For All Types Of Hewitt-Robins Screen Cloth

Now, we can give you faster delivery—*direct from our own modern plant*—of the finest quality screen cloth to meet your every need . . . Screen Cloth that gives you longer life, greater satisfaction on any type of screen, regardless of make . . . Screen Cloth that will provide you with highest efficiency, lowest cost per ton.

For shorter delivery on any type of Hewitt-Robins screen cloth send us this information:

1. Type of screen—Name of manufacturer—Model of machine.
2. Kind of screen cloth desired: Specify type *weave*—type of *wire*.
3. Size of clear opening or mesh and wire diameter.
4. Type of edge formation: Flat edges — Welded — Reinforced hook strips.
5. Length and width of panels (width measured from outside to outside of bent hooks)—Height and length of hook strips—Degree of angle inside of hook.
6. For rectangular, non-spreader or non-blind openings: Specify direction of long slot (which dimension of cloth it parallels).
7. For dewatering decks: Size of openings in mm—Single, double or no depressions—Round or triangular profile stainless steel rods.

WRITE FOR SCREEN CLOTH
BULLETIN No. 113-A1

INCORPORATED

EXECUTIVE OFFICES: STAMFORD, CONNECTICUT

CHECK FOR INFORMATION ABOUT THESE JOB-TESTED PRODUCTS FOR YOUR OPERATION

CONVEYORS:

- | | |
|---|-------------------------------------|
| <input type="checkbox"/> —Belt | <input type="checkbox"/> —Dock |
| <input type="checkbox"/> —Mine | <input type="checkbox"/> —Shuttle |
| <input type="checkbox"/> —Slope | <input type="checkbox"/> —Vibrating |
| <input type="checkbox"/> —Fixed Tripper Shuttle | |

BELTING:

- | |
|---|
| * <input type="checkbox"/> —Elevator |
| * <input type="checkbox"/> —General |
| * <input type="checkbox"/> —Hot Materials |
| * <input type="checkbox"/> —Raynile® |
| * <input type="checkbox"/> —Steel Wrapper |
| * <input type="checkbox"/> —Transmission |
| <input type="checkbox"/> —Woven Wire |

BUCKET ELEVATORS

IDLERS

SCREEN CLOTH:

- | |
|---|
| <input type="checkbox"/> —Electrically Heated |
| <input type="checkbox"/> —General |

VIBRATING SCREENS:

- | |
|---|
| <input type="checkbox"/> —Dewaterizers |
| <input type="checkbox"/> —General |
| <input type="checkbox"/> —Heavy-Duty Scalpers |
| <input type="checkbox"/> —Heavy Media |

HOSE:

- | | |
|--|-----------------------------------|
| * <input type="checkbox"/> —Acid | * <input type="checkbox"/> —Air |
| * <input type="checkbox"/> —Air Drill | * <input type="checkbox"/> —Fire |
| * <input type="checkbox"/> —Pinch Valve | |
| * <input type="checkbox"/> —Servall® | * <input type="checkbox"/> —Steam |
| * <input type="checkbox"/> —Twin-Weld® | * <input type="checkbox"/> —Water |
| * <input type="checkbox"/> —Water Suction | |
| * <input type="checkbox"/> —Flexible Rubber Pipe | |

MECHANICAL FEEDERS

STACKERS

CAR SHAKEOUTS

TRIPPERS

BELT CLEANERS

* GROOVED PULLEY LAGGING

CRUSHERS

PICKING TABLES

LOADING BOOMS

RUBBERLOK® BRUSHES

MOLDED RUBBER PRODUCTS

DESIGN AND CONSTRUCTION OF COMPLETE MATERIALS HANDLING SYSTEMS

*For immediate information about these industrial rubber products, call your Hewitt Rubber Distributor (See "Rubber Products" Classified Phone Book).

Hewitt-Robins Incorporated
666 Glenbrook Road
Stamford, Connecticut

NAME _____

TITLE & COMPANY _____

STREET ADDRESS _____

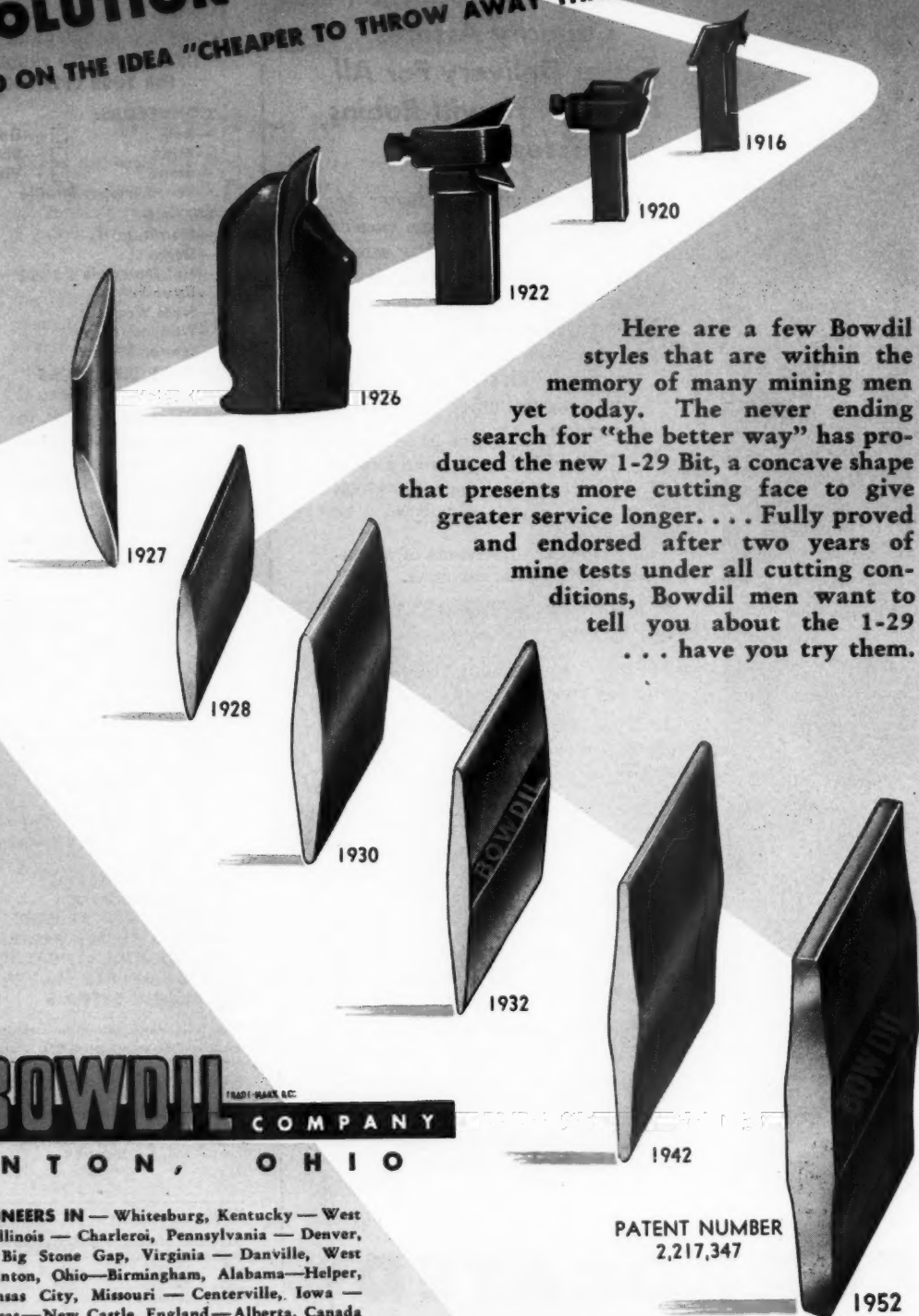
CITY _____

PO ZONE _____

STATE _____

EVOLUTION OF THE BOWDIL BIT...

BASED ON THE IDEA "CHEAPER TO THROW AWAY THAN TO RE-SHARPEN"

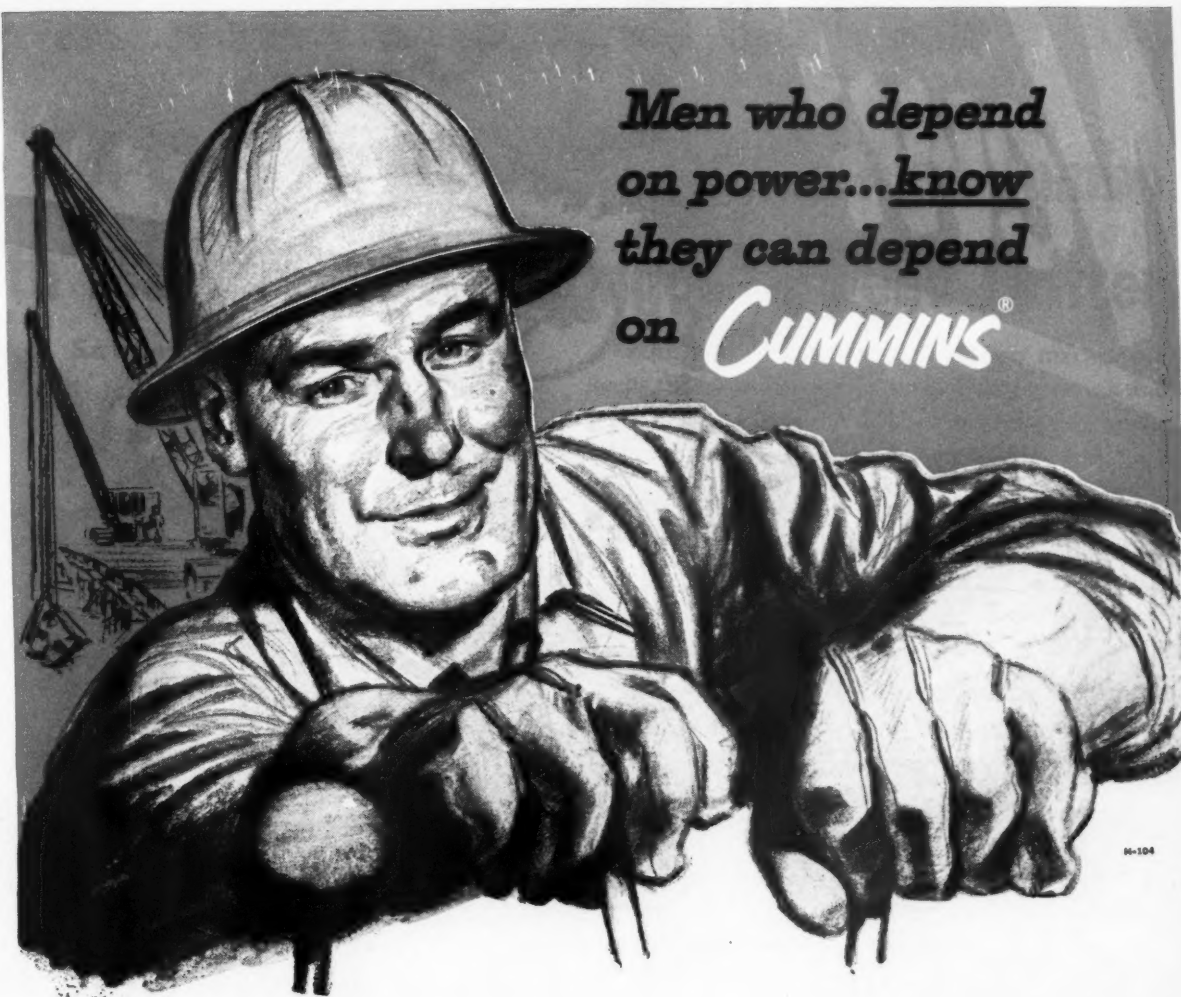


Here are a few Bowdil styles that are within the memory of many mining men yet today. The never ending search for "the better way" has produced the new 1-29 Bit, a concave shape that presents more cutting face to give greater service longer. . . Fully proved and endorsed after two years of mine tests under all cutting conditions, Bowdil men want to tell you about the 1-29 . . . have you try them.

The BOWDIL COMPANY
CANTON, OHIO

SALES ENGINEERS IN — Whitesburg, Kentucky — West Frankfort, Illinois — Charleroi, Pennsylvania — Denver, Colorado — Big Stone Gap, Virginia — Danville, West Virginia — Canton, Ohio — Birmingham, Alabama — Helper, Utah — Kansas City, Missouri — Centerville, Iowa — Topeka, Kansas — New Castle, England — Alberta, Canada

PATENT NUMBER
2,217,347



*Men who depend
on power...know
they can depend
on **CUMMINS**[®]*

CUMMINS DIESELS *are engineered to make light work of tough jobs*

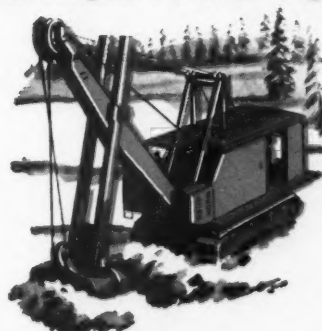
Progressive, eyes-ahead engineering is one of the big reasons why so many mine and quarry operators pick Cummins Diesels for dependability.

Consider Cummins' exclusive system of fuel injection and metering—an important factor in the unequalled performance records established by lightweight, high-speed (60-600 h.p.) Cummins Diesels. No other Diesel fuel system is so simple . . . so rugged! It delivers a uniform, properly prepared fuel charge to every cylinder. All under low pressure—no chance of bursting and leaking fuel lines.

Your Cummins dealer will be glad to tell you more about the exclusive fuel system and other engineering advantages built into every Cummins Diesel. He is an expert who knows the requirements of your job. He heads up a specialized parts and service organization—equipped to handle all your diesel power needs. Call him today . . . or write!

CUMMINS ENGINE COMPANY, INC., Columbus, Indiana

Export: Cummins Diesel Export Corporation, Columbus, Indiana, U.S.A. • Cable: CUMDIEX

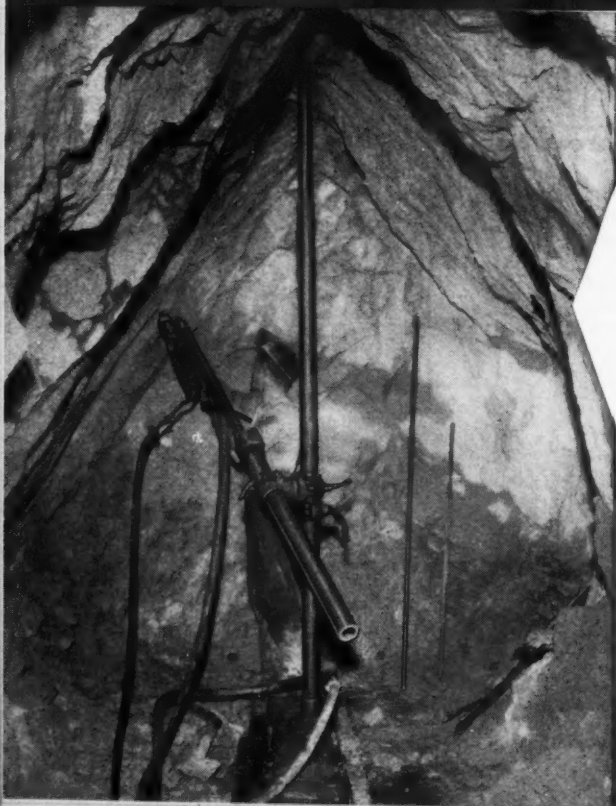


CUMMINS

Leaders in rugged, lightweight, high-speed diesel power!

New!

Speeds Up



Miners like Le Roi-CLEVELAND HC23RW Reverse Air Feed Drifters

Management does, too

Faster Steel Changes! No swing or dump nuts to loosen and reset. Your miners simply swing drifter on feed cylinder and change steels. It's not only easy — it lets them drill out the round faster.

No Stuck Steels! Positive air feed keeps drills working at peak efficiency, avoids stuck steels.

Higher Drilling Speeds! Positive air feed plus proper force of blow and strong rotation give faster drilling speeds with both steel and tungsten carbide bits. You get longer bit life, too, and drill more footage.

Low Upkeep Cost! No feed screws or feed-screw nuts to wear. No complicated power-feed mechanism to give trouble.

Easy to Operate! Built to lighten the load on your miners. Feed controls conveniently located. Reverse air feed withdraws steel from hole quickly.

Faster Set-ups! The combination of Le Roi-CLEVELAND Air Feed Drifters and air columns gives you a unit that can be set up easily and quickly. And you can get the air column in any height you want.

drilling cycles

Le Roi-CLEVELAND *self-leveling* Mine Jumbo with four-foot steel-change Air Feed Drifter

***Saves time drilling lifters!
Lets your miners drill the right
round for any ground!***

You couldn't ask for more from a mine jumbo than the performance you get from this new Le Roi-CLEVELAND. It's got plenty of stuff. And the payoff for you is faster cycles, greater tonnage per man-shift, lower costs! Here's why:

Self-leveling, air-motor-powered arm, lets miners spot and space holes quickly and easily, for the most efficient fragmentation. They don't have to loosen a bolt or tilt a boom, to complete the drilling cycle.

Exclusive rigid screw and gearing mechanism keeps the heading straight, cuts down overbreak and underbreak. Keeps the drifters in line, prevents the steel from binding, reduces chuck wear.

Offset arm provides plenty of clearance to drill lifters — without having to take time out to swing the drill under the arm.

You can get this Le Roi-CLEVELAND Self-Leveling Mine Jumbo in either single-arm or double-arm construction. Write for further information and see for yourself how either model can help you get more done every shift.

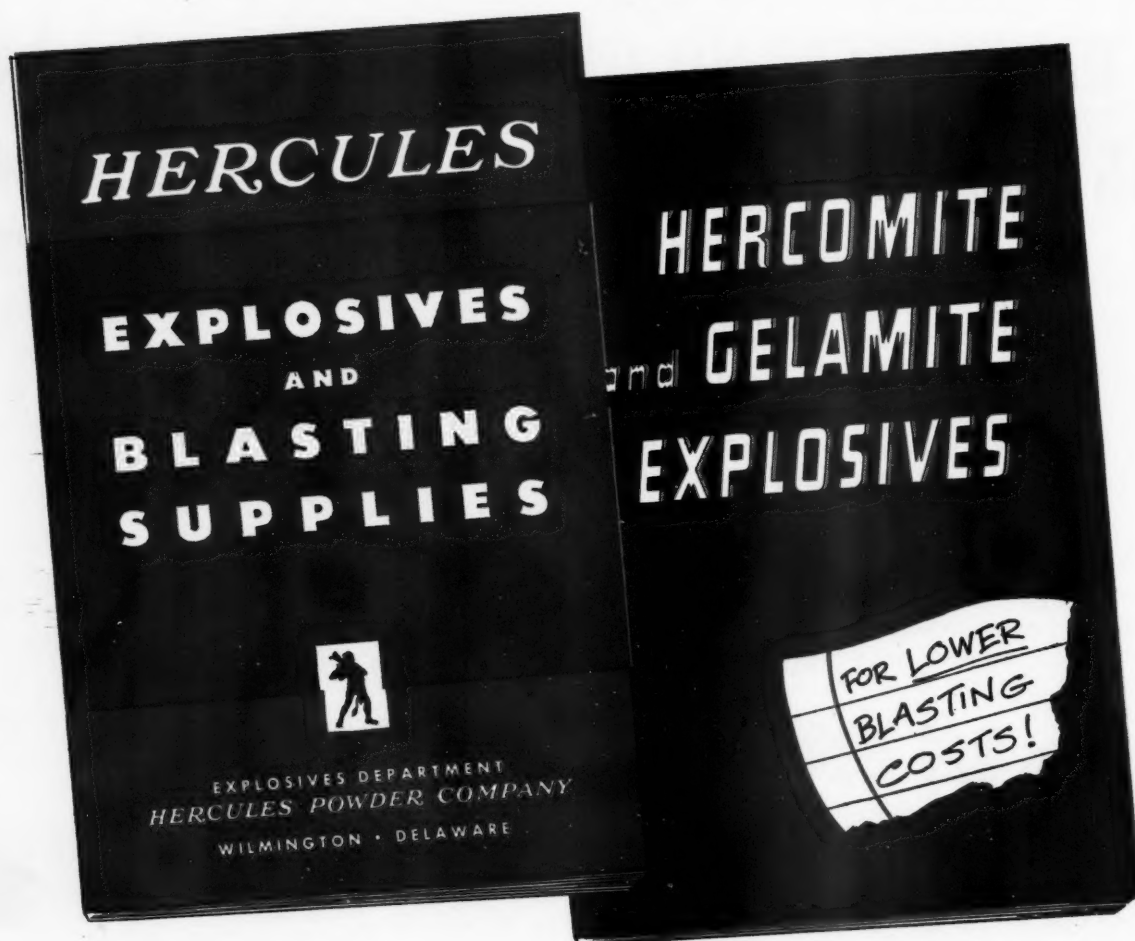
LE ROI COMPANY

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, O.

Here's a Le Roi-CLEVELAND Self-Leveling Mine Jumbo and HC23RW Air Feed Drifter with four-foot steel change in a Western zinc and copper mine.

A compact Le Roi-CLEVELAND air motor powers the arm of this mine jumbo — lets miners take it easy, yet get more done.

Explosives Up-To-Date



New Booklets Just Off The Press

Here's the latest information on Hercules' complete line of explosives and blasting supplies . . . a total of 80 pages of valuable data on these products for mining, quarrying, construction, and seismic exploration. If you use explosives in any way, these two new booklets are a "must" for your engineering and purchasing departments. Write for free copies to:

Explosives Department

HERCULES POWDER COMPANY

INCORPORATED

922 King Street, Wilmington 99, Delaware



XR53-1

THE CARE AND FEEDING OF

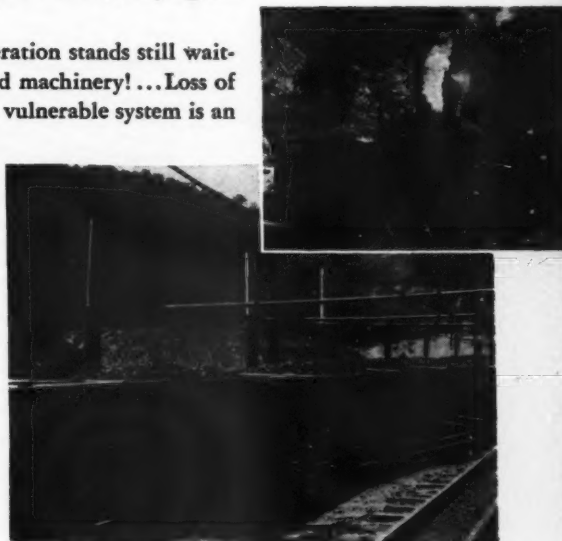
HUNGRY HOPPERS



Only mines with a *steady, constant* flow of coal can operate profitably. Like the links of a chain, each operation must be functioning. Yawning tipples and hoppers must be filled to keep them satisfied. The preparation plant waits . . . relying on smooth, uninterrupted production all along the line.

But what about a haulage shutdown, when the whole operation stands still waiting for repairs to the transportation system? Idle men and machinery! . . . Loss of tons of coal that can never be made up! To employ such a vulnerable system is an expensive form of gambling—especially when you lose.

With 'Constant Haulage' Mine Cars, this can never happen, because, you see, when a mine car needs repairs, the rest of the trip continues on — piling-up tonnage. And remember, with mine cars, men and supplies are hauled into the mine on the same transportation system that takes coal out. If you're planning a new mine, modernizing your present one—we urge you to investigate **A.C.F. Mine Cars**. American Car and Foundry Company, New York • Chicago • St. Louis • Cleveland • Washington • Philadelphia • San Francisco • Huntington, W. Va. • Berwick, Pa.



a.c.f.

MINE CARS

for Constant Haulage

CARDOX

NON-EXPLOSIVE MINING METHODS

THESE 261 MINES

Are Now Using

EITHER CARDOX OR AIRDOX MINING METHODS

WEST VIRGINIA

American Coal Company.....(3)
 Ames Mining Company.....(2)
 Anchor Coal Company.....(2)
 Brule Smokeless Coal Company.....(2)
 Carbon Fuel Company.....(2)
 Clear Creek Coal Company.....(2)
 Coalburgh-Kanawha Mining Company.....(5)
 Crozer Coal and Coke Company.....(2)
 Eastern Gas & Fuel Associates.....(2)
 Gay Coal and Coke Company.....(2)
 Gay Mining Company.....(2)
 Dorothy Gordon Coal Company.....(2)
 Gulf Mining Company.....(2)
 Hoylman Coal Company.....(2)
 Island Creek Coal Company.....(2)
 Imperial Smokeless Coal Company.....(2)
 Jacob's Fork Pocahontas Coal Company.....(2)
 Johnstown Coal & Coke Company.....(2)
 Lafayette Springs Coal Company.....(2)
 F. M. A. Leach.....(2)
 Lorado Coal Mining Company.....(3)
 Nassau Coal Company.....(3)
 National Mines Corporation.....(3)
 New River Company.....(3)
 Pardee and Curtin Lumber Company.....(2)
 Peck's Run Coal Company.....(2)
 Peerless Coal & Coke Company.....(2)
 Peters Creek Coal Company.....(2)
 Pond Creek Pocahontas Coal Company.....(2)
 Premier Pocahontas Collieries.....(2)
 Raine Lumber and Coal Company.....(2)
 Raleigh-Wyoming Mining Company.....(2)
 Red Jacket Coal Company.....(2)
 Richwood Sewell Coal Company.....(2)
 Ridgeview Coal Company.....(2)
 Royalty Smokeless Coal Company.....(2)
 Sycamore Coal Company.....(2)
 Thermal Fuel Company.....(2)
 Tioga Coal Corporation.....(2)
 Truax-Traser Coal Company.....(2)
 United Pocahontas Coal Company.....(3)
 United States Steel Company.....(3)
 Warner Collieries.....(2)
 West Gulf Collieries.....(2)
 West Virginia Coal & Coke Corporation.....(2)
 Weyanoke Coal and Coke Company.....(2)
 Winding Gulf Collieries.....(2)
 Wyatt Coal Company.....(2)

KENTUCKY

Bell & Zoller Coal & Mining Company.....(2)
 Big Jim Coal Company.....(2)
 Black Star Coal Corporation.....(2)
 Blue Bird Mining Company.....(2)
 Cinderella Coal Corporation.....(2)

Citation Coal Company.....(2)
 Columbus Mining Company.....(2)
 Creech Coal Company.....(2)
 W. G. Duncan Coal Company, Inc.....(2)
 Eblen Coal Company.....(2)
 Fourseam Coal Corporation.....(2)
 Harvey Coal Company.....(2)
 Inland Steel Company.....(2)
 Jewell Ridge Coal Corporation.....(2)
 Keniland Elkhorn Coal Company.....(2)
 Knott Coal Corporation.....(2)
 Liberty Elkhorn Coal Company.....(2)
 Marlowe Coal Company.....(2)
 Mary Gail Coal Company.....(2)
 Meem-Haskins Coal Corporation.....(2)
 Smith Coal Company.....(2)
 Stephens Elkhorn Fuel Company.....(2)
 Stoker Coal Company.....(2)
 West Kentucky Coal Company.....(2)

TENNESSEE

Block Coal & Coke Company.....(2)
 Reliance Smokeless Coal Company.....(2)
 Straight Fork Coal Company.....(2)
 Virginia Harlan Coal Company.....(2)

PENNSYLVANIA

The Berwind-White Coal Mining Company.....(2)
 Butler Consolidated Coal Company.....(2)
 Cambria Clearfield Mining Company.....(2)
 Charles E. Campbell.....(2)
 Ebensburg Coal Company.....(2)
 G. & S. Coal Company.....(2)
 Imperial Coal Corporation.....(2)
 Johnstown Coal & Coke Company.....(2)
 Marco Coal Company.....(2)
 Moffitt Coal Company.....(2)
 Morrisdale Coal Mining Company.....(2)
 Ontario Coal Mining Company.....(5)
 Pittsburgh Coal Company.....(2)
 Pleasant Valley Coal Company.....(2)
 Republic Steel Company.....(2)
 J. L. Sager Coal Company.....(2)
 Springfield Coal Corporation.....(2)
 Weirton Coal Company.....(2)
 Westmoreland Coal Company.....(2)

OHIO

Columbia Southern Chemical Corporation.....(2)
 Dindo Coal Company, Inc.....(2)
 The Farm Bureau Cooperative Association Inc.....(2)
 Gem Coal Company.....(2)
 Hanna Coal Company of Ohio.....(2)
 Jefferson Coal Company.....(2)
 Lorain Coal & Dock Company.....(2)
 Powhatan Mining Company.....(2)
 Warner Collieries Company.....(2)

CARDOX CORPORATION

ANNUAL

Roll Call

ILLINOIS

Bell & Zoller Coal & Mining Company.....(3)
 Blue Bird Coal Company
 Carmac Coal Company
 Chicago, Wilmington & Franklin Coal
 Company.....(2)
 Deer Creek Coal Company
 Freeman Coal Mining Corporation.....(3)
 Joliana Mining Company
 Mid-Continent Coal Corporation
 Moffat Coal Company
 Edward Mohn & Son.....(5)
 Old Ben Coal Corporation.....(5)
 Peabody Coal Company
 Paschirrer & Sons Coal Company.....(3)
 Sahara Coal Company
 Schull-Moake Coal Corporation
 Truax-Traser Coal Company
 Union Colliery Company
 Wilkins Coal Company

INDIANA

Enoco Collieries Company
 Ingle Coal Corporation
 Linton Summit Coal Company
 Pandora Coal Corporation
 Princeton Mining Company
 Pyramid Coal Corporation.....(2)
 Snow Hill Coal Corporation.....(2)
 Viking Coal Corporation

OKLAHOMA

Buck Creek Mining Company
 Davis & Swindle
 Premium Smokeless Coal Company
 Reliance Smokeless Coal Company

COLORADO

Arrowhead Coal Company.....(2)
 Bear Coal Company
 Black Diamond Fuel Company
 Boulder Valley Coal Company
 Canon Black Diamond Coal Company.....(2)
 Canon Monarch Coal Company
 Canon National Coal Company
 Centennial Coal Company
 Chandler Coal Company.....(2)
 Clark Coal Company.....(2)
 Clayton Coal Corporation
 Colorado Fuel & Iron Corporation
 Colowyo Coal Company
 Consolidated Coal & Coke Company
 W. D. Corley, Jr.
 Domestic Coal Company
 Dry Creek Coal Company

Graden Coal Company
 Griffith Coal Mining Company.....(2)
 Imperial Coal Company
 Jenkins & Mathis Coal Company
 Juanita Coal & Coke Company
 Louisville Lafayette Coal Company.....(2)
 Minerals Development
 McNeil Coal Corporation
 William E. Russell Coal Company
 Taylor Coal Company
 Tomahawk Coal Company

MONTANA

Bair-Collins Coal Company
 Brophy Coal Company
 Johnson Coal Company
 Nies Brothers
 Northern Coal Company
 Racci Brothers
 Sheridan-Wyoming Coal Company
 Transfer Mine
 Western Coal Company

WYOMING

Burnell Coal Company
 Colony Coal Company.....(2)
 Ronocco Coal Company
 Sheridan-Wyoming Coal Company
 Storm King Coal Company

UTAH

American Gilsontite Company
 Peerless Sales Company
 Hi-Heat Coal Company

NEW MEXICO

St. Louis, Rocky Mountain & Pacific Company

ARKANSAS

Smokeless Coal Company

CANADA

Century Coal Ltd.
 Leithbridge Collieries, Ltd.....(2)
 The Monarch Coal Mining Company, Limited
 Red Deer Valley Coal Company, Limited
 West Canadian Collieries, Limited.....(2)

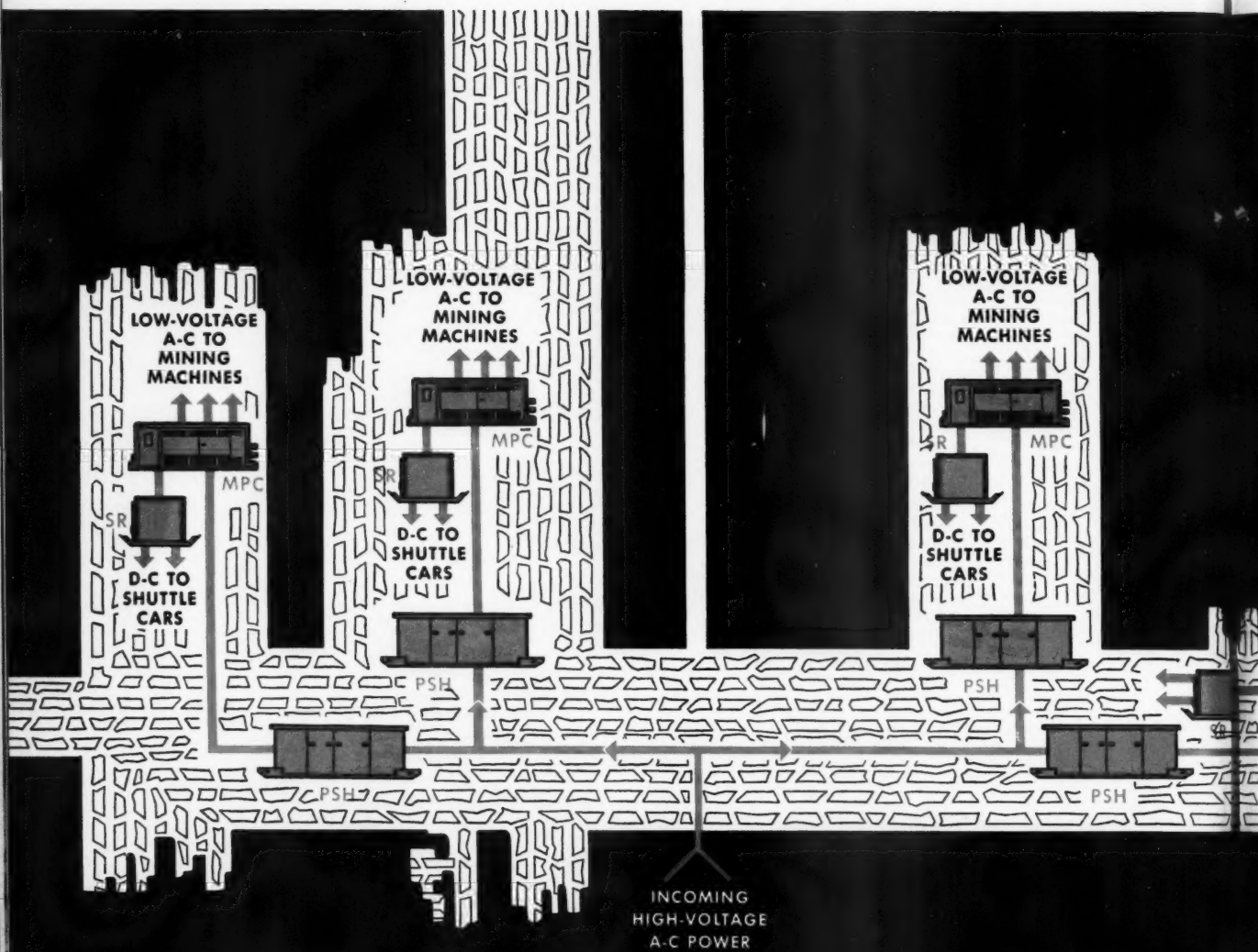
VIRGINIA

Blackwood Fuel Company, Inc.
 Buchanan County Coal Corp.....(3)
 Clinchfield Coal Corporation.....(2)
 Coal Processing Corporation
 Jewell Ridge Coal Corporation
 Page Pocahontas Coal Corporation.....(2)
 Sycamore Coal Corporation

**CARDOX
 HARDSOGG**

DRILLING EQUIPMENT

Complete line of drilling equipment designed
 to give you the maximum in drilling efficiency.



PSH—Portable Switch-house



MPC—Mine Power Center



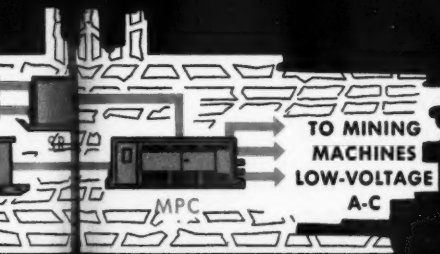
SR—Selenium Rectifier

Three new developments for A-C power systems

Here's the latest and best in power supply for a-c mining—three brand-new Westinghouse developments for use underground. Chart at left shows how they're applied.

CONTINUOUS MINING STARTS WITH CONTINUOUS POWER

This new Westinghouse equipment keeps power supply dependable—keeps it near the working face. All three units are skid-mounted, compact and light in weight. The electrical connections are easy to make and break.



1. New switch-house controls high-voltage power

High-voltage power comes down a shaft or borehole, then is sent out through individual feeders to the various working areas. Each feeder should be protected. Best way: the new Westinghouse underground switch-house. It immediately isolates the feeder in event of ground-fault, overcurrent or short circuit so that the rest of the system isn't affected.

2. Mine Power Center transforms it down

This new Mine Power Center keeps power supply where it's needed—close to the working face. Four working areas and four Power Centers are shown at left. This new unit is basically an air-cooled transformer with outgoing low-voltage feeders. A circuit breaker protects each feeder against overcurrent and ground-faults.

3. New rectifier supplies small blocks of d-c

Here's the ideal way to supply the small amounts of d-c needed in a-c mines. The new Westinghouse selenium rectifier takes a-c from the Power Center and supplies d-c through circuit breaker protected outlets. There are no major moving parts in this unit—the rectifier itself is a simple, static, plate-type device.

Call Westinghouse early on EVERY job

Westinghouse has a great deal of experience in all types of electrical equipment for mining. We can help you cut costs and improve your operations. When your next project comes up, call your Westinghouse office early in the planning stage. And for more information on these three new developments, write for B-5423. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

J-94901

YOU CAN BE SURE... IF IT'S
Westinghouse

EQUIPMENT FOR
THE MINING INDUSTRY



Rust-Proofing Keeps O-B Shells and Plugs

● O-B Expansion Shells and Plugs are rust-proofed with a protective coat of No-Ox-Id dip. Think of what this means to you in terms of storage and easy use! Rust-proof O-B Shells and Plugs can be stored underground, or even outside, without damage. Plug threads stay smooth and open. Bearing surfaces between shells and plugs stay smooth and unpitted. Plugs always turn freely, and they slide on the inner surface of shells without galling or scoring.

The same rust-proof coating lubricates the shell and plug sliding surfaces, letting them slip freely as the bolt is tightened.

Rust-proof, lubricated O-B Shells and Plugs will work when you get ready to use them. Accurately cut threads, well protected with No-Ox-Id, never jam in the bolt thread. Don't let dirty, poor-fitting shells and plugs slow you down - order O-B's for all your bolting work. They go up fast and they stay put!



Ohio Brass

"EUC" PERFORMANCE

Pays Off

IN MINES and
QUARRIES

"Eucs" are designed and built for moving coal, rock, ore, overburden and heavy excavation at the lowest cost. The simple but rugged construction of Euclids, combined with large capacity, ample power and speed, provide efficient off-the-highway hauling of practically any material.

Euclids are standard equipment in many leading open pit mines and quarries, and on construction and industrial work. Owners know that Euclid staying power and continuous operation result in more loads hauled in less time at lower cost.

Ask your Euclid distributor for data on quarry or open pit jobs similar to yours. There is a Euclid to meet your requirements for off-the-highway hauling work.



Rear-Dump Euclids—Capacity from 10 to 34 tons—diesel engines from 125 to 400 h.p., spring mounted or semi-rigid drive axles—top speed loaded up to 35.7 m.p.h.

**MORE LOADS PER HOUR—
MORE PROFIT PER LOAD**

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio

EUCLID



Amsco Chains Get Tougher With Use

How AMSCO Manganese Steel Chains Acquire Progressively Greater Resistance to Impact and Abrasion.

Actual case histories prove that AMSCO Manganese Chains outlast ordinary chains by more than 6 to 1 where impact and abrasion exist. For example, on one conveyor operation, ordinary chain had to be completely replaced every three months. When AMSCO Manganese Steel Chain was installed, only a small fraction of the links were replaced during a test period of over 24 months.

Users of AMSCO Chains benefit by unusual freedom from expensive chain replacement, breakage, maintenance-down-time and other problems caused by impact and abrasion conditions.

AMSCO Manganese Steel Chains have the unique ability to work-harden with use. In rough service, they develop a surface hardness up to 500 Brinell. They also acquire a hard glass-like polish that helps shrug off grinding abrasion. All AMSCO Manganese Steel products — tough when produced — possess the extra-value quality of actually increasing durability with in-use battering and grinding.

AMSCO Chains are made of Manganese Steel — the "Toughest Steel Known." They are produced in many standard and special shapes by American Manganese Steel Division — largest producer of manganese steel for all industry.

If you use chain, and desire a more durable alloy, you are invited to contact AMSCO. There's a good chance we can save you money and provide chains that will outlast your service life expectations.

Drag Line Type Chain—
Mining & Excavating

AMSCO Chain Assumes Many Forms To Serve Industry. A Few Are:

Detachable Chain—
Bucket Elevating

Pinlock Type with Cast-on
Dog—Log Hauling



840 Series Chain—
Bucket Elevating



Rivetless Chain—
Mining



Clinker Drag Chain—
Cement Milling

AMERICAN

Brake Shoe

COMPANY

AMERICAN MANGANESE STEEL DIVISION

422 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; St. Louis, Mo.; Los Angeles, Calif.

Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Quebec.

Here's how ROCKMASTER[®] blasting increases explosives efficiency



You can see ROCKMASTER efficiency in these pictures, taken at the height of four different ROCKMASTER blasts. There is no flying rock, no geysering of explosive force. ROCKMASTER keeps the power of the blast confined, using all the explosives energy to produce maximum breakage with maximum efficiency.

When the blast is initiated at the point of maximum confinement, the explosive force follows the line of least resistance . . . directly into the burden. With ROCKMASTER millisecond blasting, the first initiation places the burden under maximum stress, producing lines of weakness

throughout the burden. A split-second later, the next charge hits the stressed material with a shattering force that produces maximum breakage . . . maximum use of the explosive force. It is the "one-two punch" applied to blasting.

Ask your Atlas technical representative to show you the picture presentation of the ROCKMASTER story. See for yourself how the millisecond delay electric blasting caps teamed with the ROCKMASTER system of explosives choice can give you greater blasting efficiency through complete confinement of the blast.

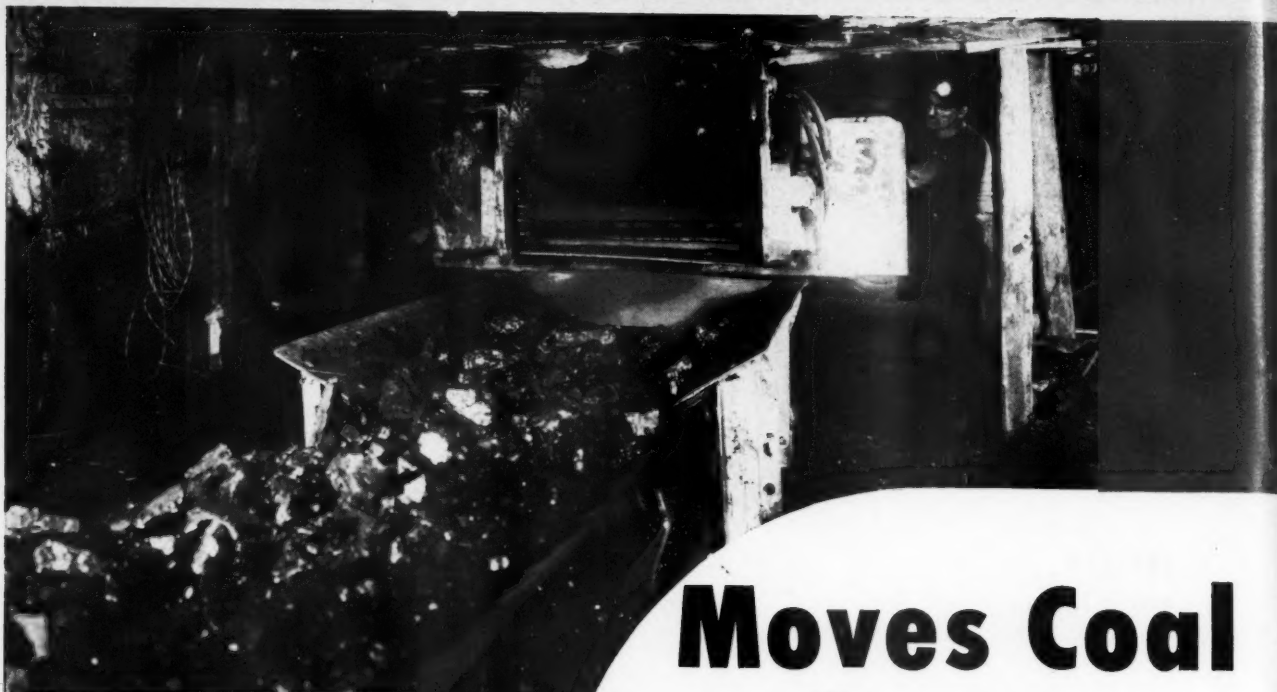


ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE

Offices in principal cities



82-51

Jeffrey Shuttle Car discharging into
the end of a Jeffrey Belt Conveyor.



86-51

Jeffrey Shuttle Car discharging into a
Jeffrey Belt Conveyor from the side.

**Moves Coal
Faster
JEFFREY
at Lower
Cost**



331-51

JEFFREY SHUTTLE CARS are designed and built to speed coal haulage between loader and conveyor or mine cars. Experience has proved that they have approached more nearly continuous operation than any system developed to date.

Model shown above features an elevating front section which permits coal to be discharged directly into mine cars or lowered for discharge into main haulage conveyors. This feature often eliminates necessity for an elevating conveyor unit to handle coal between Shuttle Car and main haulage.

SHUTTLE CARS

(Patented)

These cars are available in several heights—capacities from $3\frac{1}{2}$ to $6\frac{1}{2}$ tons. Of the cable reel type, they are available with either two or four-wheel drive and steering.

The added flexibility they give to your operation, plus the high production and low cost per ton they afford, is worthy of your investigation and consideration. For counsel about transportation methods, there is an experienced Jeffrey Engineer who will be happy to serve.

THE JEFFREY

MANUFACTURING COMPANY Established 1877

912 North Fourth St., Columbus 16, Ohio

Baltimore 2	Boston 16	Cincinnati 2	Detroit 13	Houston 2	New York 7	St. Louis 1
Beckley, W. Va.	Buffalo 2	Cleveland 15	Forty Fort, Pa.	Jacksonville 2	Philadelphia 3	Salt Lake City 1
Birmingham 3	Chicago 1	Denver 2	Harlan, Ky.	Milwaukee 2	Pittsburgh 22	

Jeffrey Mfg. Co. Ltd., Montreal, Canada

British Jeffrey-Diamond Ltd., Wakefield, England

Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.

The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio

Galion (Great Britain Ltd.), Wakefield, England

The Ohio Malleable Iron Co., Columbus, Ohio

The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

MINING
MATERIAL
HANDLING
AND
PROCESSING
EQUIPMENT



readily available



AMERICAN EXPLOSIVES

You can get quick deliveries of AMERICAN explosives and blasting supplies from our well located plants and distributing magazines. The AMERICAN line includes explosives exactly suited to your requirements—produced under intensive research, close chemical control, and unremitting care in manufacture. Always specify AMERICAN.

*Capable Field Engineers
Are Available At Your Call*

*** High Explosives * Permissibles
* Blasting Powder * Blasting Accessories**



Sales Offices: Pittsburgh, Pa. • Bluefield, W. Va. • Scranton, Pa. • Chicago, Ill. • Pottsville, Pa. • Maynard, Mass.



Get these savings in your clutches

● Clutch repairs costs down 50% . . . no delays for "warming up" loaders . . . easier and faster loading . . . these benefits have been brought to midwest mines by SUPERLA Mine Lubricants. Here's why these products will assure similar benefits for you.

SUPERLA Mine Lubricants keep transmission cases clean. Clutches operate easily with no gumming or coking caused by oil deposits. When machines are started, these lubricants flow readily between clutch plates, protect them against wear,

eliminate "clutch drag" and the necessity for warming up loaders. During long periods of continuous operation, SUPERLA Mine Lubricants do not thin out excessively, provide safer lubrication for clutch plates.

A test of SUPERLA Mine Lubricants will prove their ability to keep your loaders on the job longer with less maintenance. These products are available in oil and grease grades suitable for any type of cutter or loader. A Standard Oil lubrication specialist will gladly help

SUPERLA

REG. U. S. PAT. OFF.

Mine Lubricants

you select the proper grades for your equipment. You can reach him by phoning your local Standard Oil Co. (Ind.) office. Or, write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY



STANDARD

(Indiana)

EXTRA *Go-Power*

WITH
STERLING-WHITE Plan-A-Power
Up to 50% LONGER TIRE LIFE



TO GET the perfect "high-low" combination—high production at low operating cost—there's only one answer proved by experience under the most rugged conditions.

Go Sterling-White!

Husky Plan-A-Power assures positive traction. Built for rugged, fast, heavy haulage duty, Sterling-White is built to really take it . . . day after day.

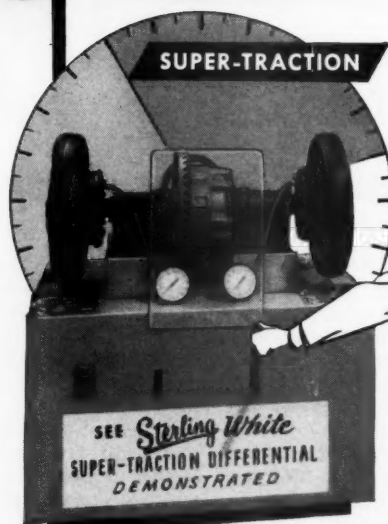
They're tailored to *your* heavy hauling needs. Get the facts from your nearest Sterling-White Representative.

THE WHITE MOTOR COMPANY

STERLING DIVISION • Cleveland 1, Ohio

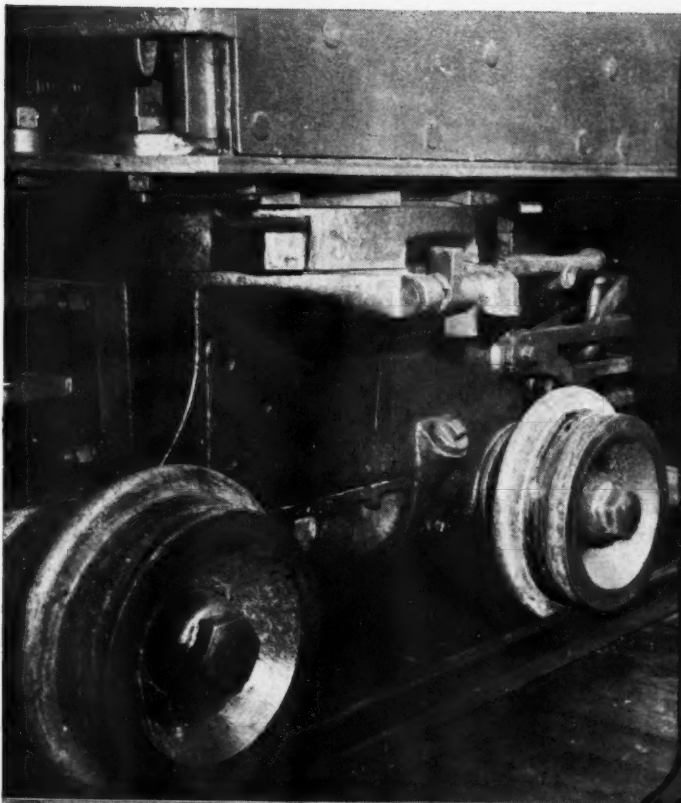
The White Motor Company of Canada Limited—Montreal

Export Department—Cleveland 1, Ohio, U. S. A.



You'll MOVE with Sterling-White!

Wheel spinning and slippage reduced to a minimum because you really get the traction . . . get the action . . . with the big loads. Super-traction differential divides power to each rear wheel exactly as road and load conditions demand. Maximum strength for more go-power . . . for 50% longer tire life. Your Sterling-White Representative will show you why.



**hugs
the
rails...**



**to hustle
your loading
...with safety**

Gardner-Denver Mine Car
Loaders are fully described
in Bulletin MCL. Send
for your copy today!

SINCE 1858

GARDNER-DENVER

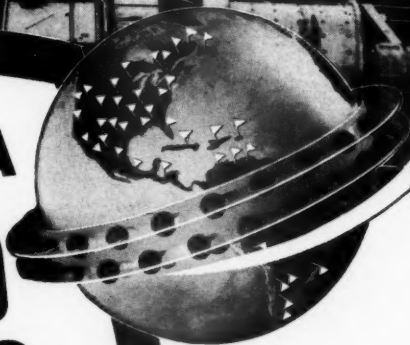
Gardner-Denver Company,
Quincy, Illinois

In Canada: Gardner-Denver
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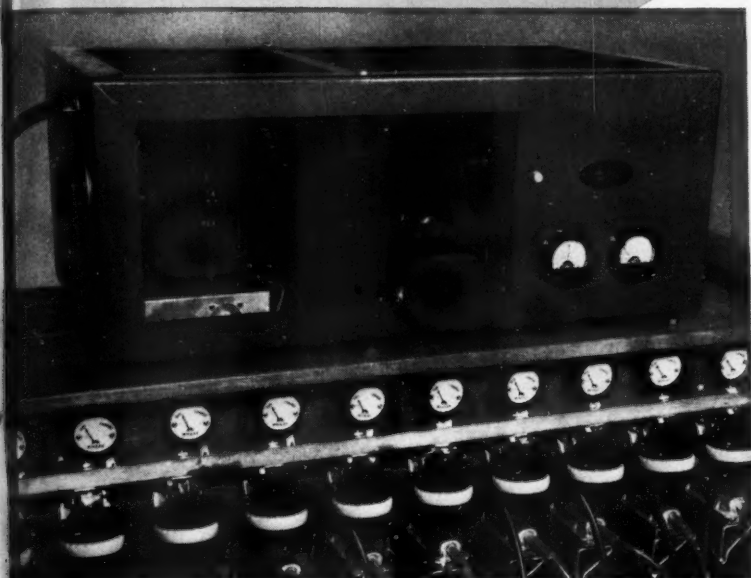
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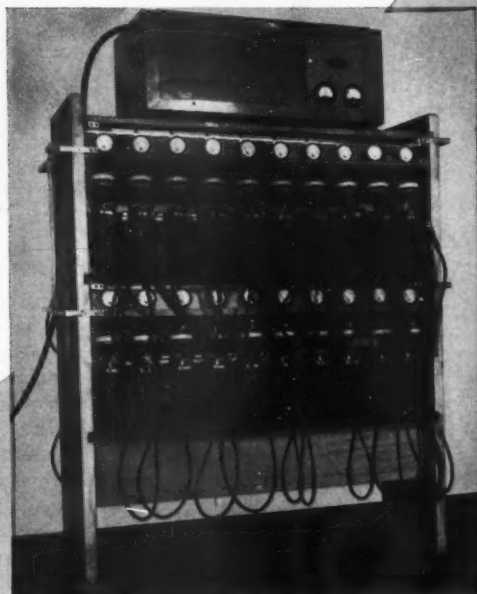
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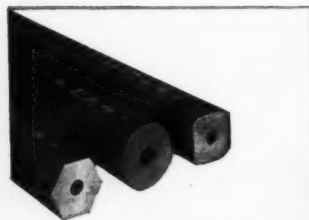
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Editorials



JOHN C. FOX, *Editor*

FEBRUARY, 1953

It's Up To Us

DURING the last half century the American economy, and that includes every one of us, has withstood the rigors of four recessions, three major depressions and three wars. Despite these discouragements our productive capacity has steadily increased and with it our standard of living. The mining industry has kept the pace, indeed has led the van in many ways.

On the pages which follow is recorded the history of mining in 1952. Mining men everywhere can be justly proud of the accomplishments reported. But we must not allow ourselves to become complacent—to sit back and admire our laurels. Some segments of the industry are operating at perilously low levels or with critically low prices. We still face the dangers of inflation and the threats of deflation. We are still saddled with huge Federal budgets and deficits; with a swollen bureaucracy that has been entrenched for 20 years and a tendency toward socialism not yet checked. We have great labor problems that have yet to be solved and a general tendency to take rather than to give.

To combat these influences it is the clear duty of each American to stand squarely behind the new administration in its efforts to maintain economic stability; to increase production, so there will be more things for better living; to improve our government, and insure our economic freedom. This is a day-to-day job. The best defense for the free-enterprise system and for our Republic is to show that in spite of all demagoguery to the contrary our free institutions can do the most for the greatest number of the people.

Mining's role in the drama ahead is to meet every demand for mineral raw materials. But every mining man—from miner to engineer to top management—must see to it that he not only does the work laid out for him on the job, but also participates in community activities, education, government. Thomas Jefferson once said: "That government is strongest of which every man feels himself a part." Our government needs to be the strongest in the world. It can be if we all feel ourselves a part of it and act accordingly.

Mining Congress Journal is proud to present the authors whose cooperation made possible this Annual Mining Review. The mining industry owes a debt of gratitude to these men for their fine contributions to the History of Mining in 1952, as recorded on pages 44 to 127.

• The iron ore industry had its problems in 1952. FAYETTE BROWN, JR., who has been assistant vice-president of the Cleveland-Cliffs Iron Co. since July, 1952, tells how these problems were handled in his review of the industry, which starts on page 44. Mr. Brown began working for Cleveland-Cliffs in 1937 at their Michigan operations. He was transferred to the Minnesota district office in 1940 and in 1944 to the main office in Cleveland.



• Progress in Mechanical Coal Mining is discussed on page 47 by J. W. WOOMER, consulting engineer. Mr. Woomer spent the years between 1925 and 1940 working for Pittsburgh Coal Co. as a mine superintendent; for Hanna Coal Co. as chief mining engineer; and for the W. H. Warner Co. as general manager of mines. Since 1940 he has been a consulting mining engineer. He has done work in England, France, Germany, Greece, Turkey, Australia, China, Manchuria, Chile and Mexico.



• On page 49, BLAINE S. SMITH's review of the Cement Industry begins. Mr. Smith began work with the Chicago & North Western Rwy. in Chicago. Ten years later, he joined the Universal Atlas Cement Co. as a salesman, rising to general sales manager and vice-president. In 1928 he left to become president of Penn-Dixie Cement Corp. and in 1936, returned to Universal Atlas as president and director, positions he now holds.



• MILES P. ROMNEY reviews Manpower and Labor Relations in a particularly timely article which begins on page 52. Mr. Romney is now manager of the Utah Mining Association. Before that he was a geologist for the United States Smelting Refining and Mining Co. He has been closely associated with recent manpower and labor developments in the far West and draws upon his knowledge of the situation in his article.

• S. H. BOSHKOV received his formal education at the American College of Sofia in Bulgaria and School of Mines, Columbia University. His underground mining experience was gained in the east and he was associated with the U. S. Bureau of Mines at Rifle. He is now assistant professor of mining at the School of Mines, Columbia University and does consulting work on the side. Beginning on page 54 Mr. Boshkov discusses recent advances in underground mining practices.

• C. J. POTTER, whose review on the Economic Status of Bituminous Coal begins on page 58, is a graduate of the School of Mines and Metallurgy of the University of Missouri and the West Virginia University. With his intimate knowledge of the coal industry, he was called to Washington during World War II to work in various government agencies. In 1947 he was named president of Rochester & Pittsburgh Coal Co. He is a director of the American Mining Congress.



Annual MINING REVIEW

• **THOMAS M. WARE** reviews Potash and Phosphate in a timely article which begins on page 62. Since being discharged from the U. S. Navy after World War II, Mr. Ware has been associated with International Minerals & Chemical Corp. He has been chief engineer of that corporation since 1949 and since June, 1952, has also been vice-president in charge of the Engineering Division.



• **NATHAN ARBITER** reviews advances in milling practice in an article beginning on page 69. He is associate professor, Division of Mineral Engineering, School of Mines, Columbia University. He served as a research metallurgist with Phelps Dodge Corp. and on the staff of Battelle Memorial Institute before joining Columbia.



• **Safety in Mining** is reviewed by **JOHN T. RYAN, JR.**, on page 66. Mr. Ryan has been closely associated with safety in mining since his graduation from Harvard in 1936, when he joined the Mine Safety Appliances Co. He is now executive vice-president and a director of that company. Mr. Ryan has long been active in the American Mining Congress. He is a director of the organization and served as chairman and is a director of the Manufacturers Division.

• **J. C. CARRINGTON**, a native of San Antonio, Texas, is a graduate of Princeton University. He joined the Freeport Sulphur Co. organization in 1939. He has risen steadily, being made assistant to the president in 1947 and a vice-president in 1952. His comprehensive article on Sulphur starts on page 78.



• **HAROLD J. ROSE** (left) is vice-president and director of research for Bituminous Coal Research, Inc., and a member of the USBM advisory group on synthetic liquid fuels. Dr. Rose is the author of several papers on solid fuel investigations here and abroad. He also holds the Grasselli gold medal of the Society of Chemical Industry.

• **JOHN W. IGOE** (right) is technical editor for BCR, and is in charge of that organization's publications and technical information. He has a broad background in technical writing and has had much experience in marketing development.

These two have collaborated to produce the informative article on Bituminous Coal Research found on page 72.



Review Authors

(Continued from page 41)

• Before joining the Quebec Iron & Titanium Corp. in 1949, I. K. HEARN worked in a variety of underground and surface jobs for the Tennessee Coal & Iron Div. of U. S. Steel Corp. From 1949 until June, 1952, he was assistant to the president of Quebec Iron. Presently he is occupied with matters pertaining to Kennecott Copper Corp.'s mining operations. From this position he has written an important review on copper which begins on page 85.



• FRANK F. KOLBE, president of The United Electric Coal Cos., began his association with the coal industry in 1934, when he and two associates purchased the then largest interest in The United Electric Coal Cos. His experience outside the coal industry is also very wide. He was assistant treasurer of General Motors from 1922 through 1928; president of Pathe Film Corp. from 1935 to 1937. Mr. Kolbe's optimistic report on Strip Mining of Coal begins on page 88.



• JOSEPH L. GILLSON is geologist for E. I. du Pont de Nemours & Co., Inc. His analysis of the industrial minerals situation appears on page 90. In the course of his work, Mr. Gillson travels far and wide and sees at first hand the mining of many of the commodities about which he writes.

• Educated at Northwestern University and Johns Hopkins University, RICHARD M. FOOSE has had a broad and varied background as a geologist. During the war he was senior geologist of the Pennsylvania Geological Survey in charge of all strategic minerals investigations. As a consulting geologist, he has worked all over the United States, in Canada, Mexico and Europe. His comprehensive review of Exploration and Geology starts on page 98.



• FELIX E. WORMSER has a deep understanding of the mining industry. His first experience was gained as mining engineer in Oregon. He served a five-year hitch on the editorial staff of Engineering and Mining Journal and was a consulting mining engineer for a time. He then became secretary-treasurer of the Lead Industries Association. He is now a vice-president of the St. Joseph Lead Co. and has contributed the comprehensive review of the lead industry starting on page 101.



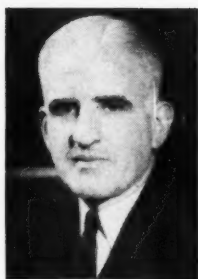
• C. A. Garner has been long associated with the anthracite industry. At present, he is vice-president in charge of operations of Jeddo-Highland Coal Co. His report on the industry appears on page 103.



• R. G. KENLY joined the research department of The New Jersey Zinc Co. in 1919, specializing in work on zinc metal. He later transferred to sales work with headquarters in New York and since 1951 has been in charge of all sales for the company. He draws on his thorough knowledge of the industry to paint the zinc picture which begins on page 106.

• Coal Preparation Progress has been outlined by ADRIAN DORENFELD of the University of Alabama. Mr. Dorenfeld is a graduate of the School of Mines at Columbia University and spent eight years with western mining companies, holding positions from operator to mill superintendent. For the last three years he has been teaching at the School of Mines, University of Alabama. His informative review begins on page 109.





• **DONALD M. WHITE**, secretary and treasurer of The Aluminum Association, describes the aluminum situation in an article beginning on page 112. The first 18 years of Mr. White's business career were spent in the banking and stock brokerage businesses. In 1943 he joined The Aluminum Association as assistant secretary, rising to his present position in 1945.



• **HON. PAT McCARRAN**, Senator from Nevada, the Silver State, again contributes a splendid report on silver. His complete familiarity with the silver situation makes him particularly well fitted to review that topic. His review appears on page 116.

• **Underground Coal Transportation** is reviewed by **NEWELL G. ALFORD**, consulting mining engineer of Pittsburgh, starting on page 114. Mr. Alford began his coal mining career on the rear end of a chain at Gary, W. Va., in the summer of 1907. From then until 1920, when he joined Howard N. Eavenson in a mining engineer partnership, he gained a wide variety of experience. Mr. Alford is no stranger to Mining Congress Journal, having served a term as associate editor in the 1920's.



• **CHAS. H. SEGERSTROM, JR.**, was born in Sonora, Calif., and has lived all his life in the Mother Lode. He served as vice-president of the Nevada-Massachusetts Co. from 1937 to 1946. At that time he became president of the mining company, the position he holds at this time. He is also president of the Rare Metals Corp. and has been associated with several gold mining properties in the Mother Lode. The tungsten situation is reviewed by him in an interesting article on page 121.



• **The Sale of Coal Mine Equipment** during the year is reviewed by **DR. W. H. YOUNG** and **Mr. R. L. ANDERSON** of the USBM on page 118. Dr. Young (left) has been associated with coal economics since 1930, when he first joined the U. S. Bureau of Mines as an economist in the Coal Economics Division. He has served as chief of the Bituminous Coal Section, USBM, since 1944.

In 1923, R. L. Anderson (right) began his service in the mining industry with a firm of consulting mining engineers in Pittsburgh. Since 1934 he has been employed by various government agencies having to do with coal. At the present time he is an engineer with the U. S. Bureau of Mines.



• **NEIL O'DONNELL** was born in Butte, Mont., before the turn of the century. In the years since his graduation from the Montana School of Mines, he has been associated with mining operations in seven western states and six foreign countries. Currently he is assistant general manager of the Falconbridge Nickel Mines Ltd., of Canada. His review of gold begins on page 122.



• **Mercury** is reviewed by **S. H. WILLISTON**, executive vice-president and director of the Cordero Mining Co. in an article starting on page 124. Mr. Williston is also chairman of the strategic metals committee of the American Mining Congress. At one time he was chairman of the Alloy Committee, National Minerals Advisory Council and chairman of the Mercury and Antimony Sub-Committee, Non-Ferrous Metals Advisory Committee to the Munitions Board.



• **F. W. LIBBEY** has had underground mining experience in Canada and the southwestern United States, operating gold and copper properties. He has worked as a consulting mining engineer and, since 1938, has been with the Oregon State Department of Geology and Mineral Industries, as director since 1944. Mr. Libbey is also a member for Oregon on the Board of Governors of the American Mining Congress. His description of the chromite situation appears on page 125.

• **Antimony** is reviewed in an article written by **JAMES P. BRADLEY** appearing on page 126. Mr. Bradley is eminently qualified to do this review as he has been handling the marketing of antimony and tungsten products for many years for the Bradley Mining Co. At the present time he is vice-president of that company.



A new monthly record was set in September when 14,388,632 tons were shipped by vessel

Iron Ore Production

**All 1952 Requirements Met in Spite of Shutdown—
Industry Aims at 135,000,000 Tons in 1953**

By **FAYETTE BROWN, Jr.**

Assistant Vice-President
Cleveland-Cliffs Iron Co.

DURING the eventful year of 1952 the iron ore industry met the economic and political problems with which it was faced with full force. As in the past, it made available to the steel industry the full requirements of this basic raw material. Despite the complete shutdown of all mines in the Lake Superior District, as well as in other producing areas of the country, for two months at the height of the Great Lakes shipping season, a total of an estimated 97,900,000 gross tons were shipped by all U. S. producers to the many pig iron and steel producing plants in the country. Of this amount approximately 5,000,000 gross tons were exported, principally to Canada and Japan. An estimated 9,500,000 gross tons were imported from foreign nations, so that an estimated 102,400,000 tons were shipped for domestic use. This compares with similar shipments in 1951 of 122,500,000 tons, representing a decrease of approximately 20,000,000 tons, or 16.4 percent.

Despite the emphasis which has been given to the development of new iron ore areas outside the U. S., the great steel industry is dependent almost entirely on the major producing areas

within our borders. As in the past, the Lake Superior District, including Minnesota, Michigan and Wisconsin, is the largest producer. Shipments in 1952 amounted to 78,100,000 gross tons, a decrease of about 17 percent from the previous year. The large

open pit mines of Minnesota were mined at capacity, and if all production had not been shut off for the months of June and July it is not unreasonable to expect that the shipments of 94,400,000 tons in 1951 would have been surpassed. The addition of eleven new ships to the American fleet aided greatly in transporting all the iron ore requested by the steel industry before the end of the navigation season early in December despite the practically complete cessation of shipping during two of the best shipping months of the year. A new monthly shipping record was made in September when 14,388,632 tons were shipped by vessel. One interesting fact is that during the month previous, which was preceded by a two-month shutdown of all mines and when shipping activities were at a stand-



Stripping of magnetic orebody of Bethlehem Steel Corp. at Marmora, Ontario, progressed satisfactorily

still, all previous monthly records had also been beaten. This reflects the remarkable cooperation of everybody connected with this industry. An all-out effort was put forth by the operating forces at the mines, railroads, and shipping concerns, showing the recuperative powers of private enterprise despite the many interferences experienced from various sources.

Although the Lake Superior District is the bulwark of the iron ore industry, remarkable production performances were seen in the other important iron producing areas. The Southern District mines of Alabama, Georgia, Missouri and Texas contributed an estimated 7,500,000 gross tons, or 7.6 percent of the domestic production. Due mainly to the steel strike, this represents a decrease of about 23.5 percent from shipments during 1951. A decrease of about 20 percent was experienced in the Northeastern District (New York, Pennsylvania and New Jersey); 4,500,000 tons, or 4.6 percent of the total domestic shipments, were shipped from this area compared to 5,600,000 tons shipped in 1951. Shipments from the Western District mines of California, Nevada, Utah and Wyoming increased from 6,900,000 in 1951 to 7,800,000 tons during 1952, an increase of about 13 percent. These properties account for 8.0 percent of the total domestic production.

Imports Increased

To augment the domestic production of iron ore an estimated 9,500,000 gross tons of various grades of iron ore were imported. The principal countries from which ore was imported were Canada, Sweden, Chile, Venezuela, Brazil and Liberia. As an offset to these imports approximately 5,000,000 tons were exported—principally to Canada and Japan. The percentage of imports to total domestic



Reserve Mining Co. completed a 300,000-ton per year pilot plant at Babbitt, Minn., to treat magnetic taconites

production and imported iron ore during the year was 8.8 percent, as compared to 8 percent in 1951. This increase indicates a growing trend toward supplementing our large iron ore reserves with material from other nations. The increase over the past several years has been relatively small in terms of tonnage, but as far as the ratio to total domestic production is concerned imports have increased from 3.8 percent of domestic output in 1946 to 8.8 percent during the past year. As a result of the development projects now under way, however, ore from foreign shores will undoubtedly be arriving in larger amounts.

New Furnaces Will Need Ore

With five new blast furnaces brought into operation during the year, two others due for blowing in shortly and

about seven more expected to be in production in 1953, iron ore requirements are increasing. To meet this greater demand, the iron ore industry expended considerable time and finances in exploration work and metallurgical research during 1952. No new large domestic iron ore sources were announced during the year, but confirmation of extensions to present ore bodies insure the continued ability to furnish from domestic sources the bulk of iron ore requirements for the steel industry. In addition to the reserves of direct shipping ore, great strides forward were made in the development of metallurgical processes to beneficiate the low grade material.

In 1952 approximately 25 percent of the ore shipped from the Lake Superior District was treated by either straight washing, or high density separation, while developments in fine

IRON ORE *SHIPMENTS BY PRODUCING DISTRICTS OF THE UNITED STATES IMPORTS AND EXPORTS, 1948-1952

District	1948		1949		1950		1951		1952†	
	Millions gross tons	% of Total	Millions gross tons	% of Total	Millions gross tons	% of Total	Millions gross tons	% of Total	Millions gross tons	% of Total
Lake Superior:										
Minn., Mich., Wis. . .	83.5	82.3	69.2	81.5	79.9	81.9	94.4	80.9	78.1	79.8
Southern:										
Mainly Ala., Ga., Mo. and Tex.	9.2	9.1	8.1	9.6	8.6	8.8	9.8	8.4	7.5	7.6
Northeastern:										
N. Y., Pa. and N. J. . .	4.5	4.4	3.8	4.5	4.7	4.8	5.6	4.8	4.5	4.6
Western:										
Mainly Utah, Calif. and Wyo.	4.3	4.2	3.7	4.4	4.4	4.5	6.9	5.9	7.8	8.0
Total	101.5	100.0	84.8	100.0	97.6	100.0	116.7	100.0	97.9	100.0
Imports	6.1		7.4		8.4		10.1		9.5	
Exports	3.1		2.4		2.2		4.3		5.0	
Imports as % of production & imports . .	5.7%		8.0		7.9		8.0		8.8	

* Exclusive of "By-Product" cinder and sinter from various sources.

† 1952 partly estimated—final figures not available.

Source—U. S. Bureau of Mines and others.



Jones & Laughlin Steel Corp. increased the capacity at its Benson mine in New York

grinding, magnetic separation, flotation and agglomeration grew closer to commercial being. The Erie Mining Co. (owned by Bethlehem Steel Co., Youngstown Sheet & Tube Co., and Dalton Ore Co.) announced plans for the large scale development of its taconite property at Aurora, Minn. The company contemplates the construction of an initial concentrating plant at the mine with an annual capacity of 5,250,000 tons of pellets, with continuing expansion thereafter

additional unit is completed in 1957, 3,750,000 tons of pellets are expected to be shipped per year. Oliver Iron Mining Division of U. S. Steel Corp. has also constructed a large concentrating plant and sintering and nodulizing facilities at Virginia, Minn., to treat large tonnages of magnetic taconite and fine ores owned by that company on the eastern portion of the Mesaba Range. Elsewhere in the Lake Superior region Hanna Coal & Ore Corp. completed its experimental

the martite reserves of the property. Bethlehem Steel Corp. also started full scale development of its new Grace mine near Morgantown, Pa. Initial production is expected by the middle of 1954.

Foreign Projects Active

In Canada, Steep Rock Iron Mines, Ltd., continued the development of the new Hogarth mine in addition to the Errington underground mine. Both projects are expected to come into production during 1953. The stripping of the magnetic orebody of Bethlehem Steel Corp. at Marmora, in southeastern Ontario, also progressed satisfactorily and the mine should be ready for initial production late in 1954 or early in 1955. The Iron Ore Co. of Canada pushed the construction of the railroad from Sept Isles, Quebec, to the concessions, about 350 miles north in northwestern Labrador and New Quebec. Present plans indicate that the principal construction will be completed by the end of 1953 and shipments will start in 1954.

In Venezuela, Bethlehem's El Pao mine produced almost 1,800,000 gross tons during the year. The development of Cerro Bolivar by U. S. Steel Corp. through its subsidiary, Orinoco Mining Co., was started on a full scale basis during the year. Initial



Full scale development was begun at Bethlehem's Grace Mine near Morgantown, Pa.

to an ultimate operation of 10,500,000 tons. Present production is being obtained from a 200,000-ton-per-year pilot plant. According to announced plans, future development will include the construction of a railroad to a dock to be built at Two Islands, on Lake Superior, and also a steam-electric power plant at the lake site.

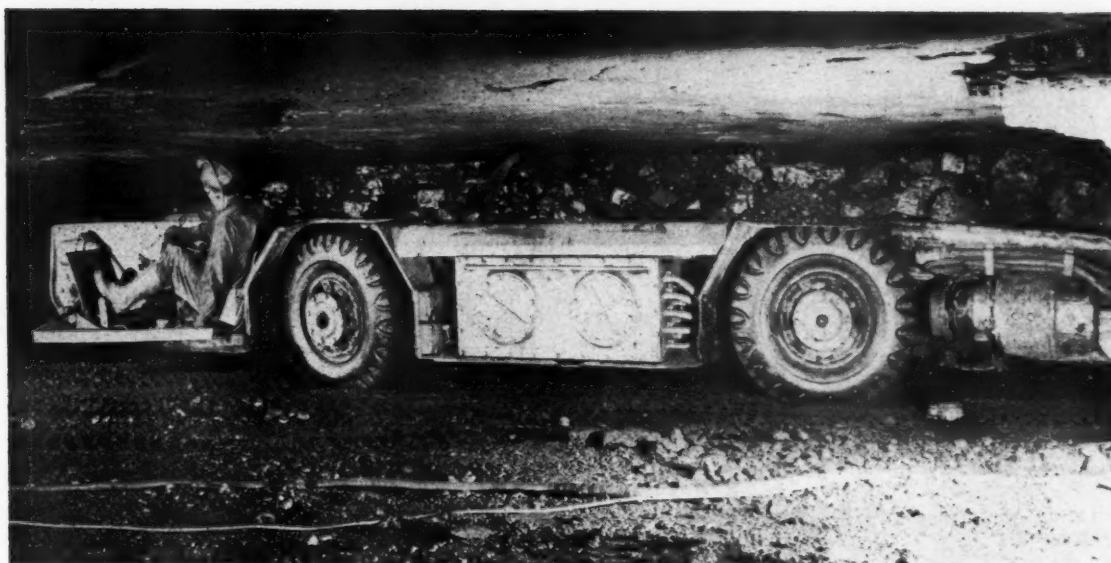
Reserve Mining Co. (owned by Republic Steel Corp. and Armco Steel Corp.) also completed a 300,000-ton annual capacity pilot plant at Babbitt, Minn., to treat the magnetic taconite in its lands. Construction was also commenced on the port facilities at Beaver Bay, on Lake Superior. Present plans call for the first concentrating and agglomerating plants to be completed at Beaver Bay late in 1955. This plant will produce 2.5 million tons of pellets per year, and when the

work on low grade iron formation at the Groveland property near Randville, Mich., not far from the producing mines of the Menominee Range. The Humboldt Mining Co. (owned by Ford Motor Co. and The Cleveland-Cliffs Iron Co.) commenced the development of the Humboldt mine on the Marquette Range. This will initially be a 200,000-ton shipping product per year operation using flotation to concentrate the hematitic material existing in the property. It is expected that the capacity will be materially increased later with the construction of additional plant units. Production is expected to commence in 1954.

Elsewhere in the country, Jones & Laughlin Steel Corp. increased the capacity at its Benson mine in New York and added a new plant to treat

work has been concentrated on the dredging of the Orinoco River to permit large deep-draft ore carriers to load at the new port at Puerto Ordaz, at the confluence of the Orinoco and Caroni Rivers. The 100-mile railroad from the property to the dock was also started by the contractors, and present plans call for shipments in 1954.

The results of 1952 operations of domestic mines bear witness to the fact that the iron ore industry is aware of its responsibilities to the nation by making available to the steel industry its requirements of iron ore. The industry faces a large task in meeting these requirements, estimated to be in the neighborhood of 135,000,000 gross tons of iron ore, if the steel industry operates at full capacity during 1953.



Mechanical mining in thin seams received much attention during the year

Mechanical Coal Mining Progress

Continuous Mining Came of Age—Continued Advances in Underground Mechanization Point to Even Higher Output Per Man in Future

AFTER all of the concern about panaceas for the coal industry which cropped up in the latter part of 1952 is analyzed, enlightened management's viewpoint at the end of the year is quite cleancut.

Dynamic operators have discarded any thoughts of stabilization by Government or by the Union and stand firm for increased mine modernization, for better money planning and for a straightforward look into the future with research.

The forecasts of future nuclear power plants, increased combustion efficiency, rising transportation costs and the expanding use of competitive fuels are overshadowed by the continuing strength of the steel industry's coal demand, the increasing need for fuel mined for a strictly Btu market and the future chemical horizon markets. The state of mind of the industry is best expressed by the generally accepted additional coal production forecast as being needed by 1975 and in the continued determination of the industry to lower its costs.

Statistics show that over-all the bituminous coal industry's productivity increased from 5.25 tons per man day in 1939 to 7.00 tons per man day in 1951. It is not too risky to venture that the 1952 official over-all bitumi-

By J. W. WOOMER

Mining Engineer
Wheeling, W. Va.

nous coal productivity figure will be nearly 7.25 tons per man day. These increases are the trustworthy yardstick of the increased mechanization of the industry.

The year 1952 saw the widespread and continued application of accepted production tools such as better lighting, two-way radio underground communication, Airdox, mantrip cars, better fire fighting equipment, better drilling and cutting steels and better electric cables and grounding practice.

The outstanding 1952 machinery application and progress, however, may be discussed under two general headings as follows,

- a. Thin Seam Mechanization.
- b. Continuous Mining.

Thin Seam Mechanization

With the aid of roof bolting and the refinement of large capacity mobile loaders which could operate in 30 to 36-in. seams, 1952 saw the application of nearly 100 such new loading units. Many of these were in mines and in thin seams which were formerly considered unworkable. Most of these units were serviced with low height

rubber-tired shuttle cars. To a lesser extent, and mostly under good roof conditions, there was a limited expansion of the so-called piggy-back and chain conveyor application.

Only limited cutting machine advancements took place, excepting that of a 26-in. rubber-tired universal machine tailored to this thin seam job.

Summed up, 1952 has at least brought 30 to 40-in. seam coal's mechanization up to the relative efficiency enjoyed by 40 to 60-in. seams for the last 15 years.

Continuous Mining Progress

Outstanding mining advance in 1952 was in the application of the so-called continuous mining machines. These can be discussed under two categories, viz., spiral auger type and other types.

Spiral auger mining technique and application might well have been reported under the thin seam discussion. However, during the year augers as large as four feet in diameter were applied to coal. While most of such applications were in stripping, interest in strictly underground applications was intensified to cope with thin seams and bad roof conditions. At the year's end there were about 200 such machines in strip and underground work. These units were pro-



The industry is headed toward an eight-ton-per-man day

ducing an average of 80 tons per working shift.

By the end of 1952 there were 200 underground continuous mining machines in operation of the ripping, boring and vibrating type. These represent the true continuous mining job.

In 1951 these machines produced about 7,000,000 tons of coal. It appears that final figures for 1952 will approach 9,250,000 tons.

Outstanding and unqualified conclusion from the above performance is that continuous mining came of age during 1952. This recognizes the fact that most of the current applications are in 42 to 60-in. seams and, to some extent, in average to better than

average over all mining conditions.

The present degree of the continuous miners' application seems to be a repetition of the swing to full-seam mining away from selective mining. This took place 12 years ago after all efforts to create an appreciable tons per man increase by attempts at mechanical gobbing and special timbering had failed to upgrade selective mining performance to any considerable degree. Continuous mining seems to be the answer to the necessity for a sharp increase in conventional mining's performance.

The Future

The history of coal mechanization in 1952 becomes more important when

its trends are carried forward into 1953 forecasts.

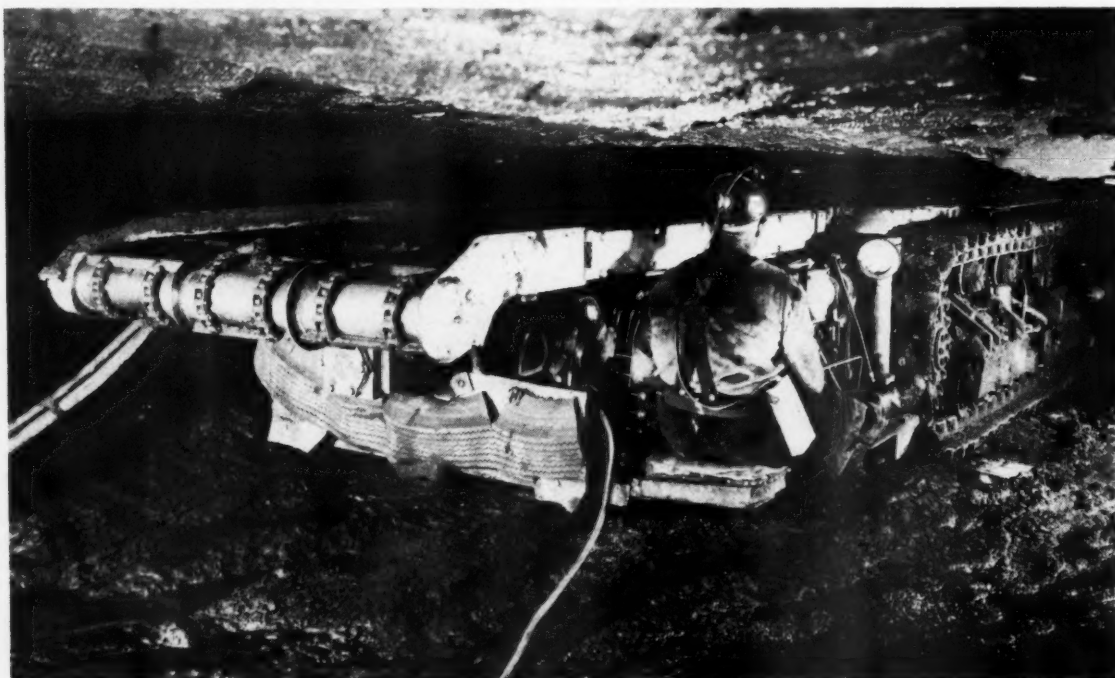
Thin coal operators in 1953 will have available higher capacity conventional mobile loaders. These loaders, with increased application of belt conveyors in tandem with shuttle cars, should increase productivity from mines in thin seams.

In the field of continuous mining it is reasonable to forecast that 50 percent of the 1953 application of continuous miners will be in low coal. At least two of the manufacturers of continuous miners have such equipment ready for seams between 30 and 36 in. where roof bolting is feasible.

However, the thick seam operators, who have been slow to adopt continuous miners because of the narrow margin between conventional and continuous mining, will have available a large capacity continuous miner in 1953 from at least one manufacturer.

Furthermore, by the end of 1953 it is reasonable to expect that the present conveyor development for better coal transportation from continuous miners will be sufficiently advanced to warrant serious consideration of such methods.

Nineteen fifty three, therefore, seems to hold good prospects of giving the industry more thin and thick seam mines equipped with the ultimate in mechanized face machinery. This will be the culmination of 1952's groundwork. These applications plus continued use of better auxiliary tools point to an average productivity of at least eight tons per man for the U. S. bituminous mining industry in the not too distant future.



Production from continuous mining machines continued to grow



Increased output from plants like this one of Universal Atlas Cement Co. at Buffington, Ind., helped set new production peak

Trends in the Portland Cement Industry

Another Record Year Tops All Others in Production and Accident Prevention

By **BLAINE S. SMITH**

President
Universal Atlas Cement Co.

NEW records in cement production have been established each year since World War II. Preliminary figures indicate the new peak reached in 1952 was approximately 249,000,000 barrels. This cement was produced from 154 plants located in 37 states. This was a notable achievement since the record production was accomplished in spite of crippling strikes which cost the industry between four and five million barrels of production. The cement industry was able to make such record production because of new mills which started producing late in 1951 and during 1952, plus the increased production from existing plants through the installation of additional facilities, better utilization of existing plants through improved mill practices and modernization. These increases in production more than offset the production loss due to strikes.

Some publicity has been given during the past few years to cement shortages in some localities. The year 1952 was no exception. It is difficult to measure the extent of a shortage because a small shortage can be multiplied many times. When a consumer tries to purchase cement from several dealers who happen to have no stock at the particular time, all of the deal-

ers record it as a lost sale but there was only one original order. A certain amount of criticism is inevitable during times of excessive demand for any product even though the duration is short. During the last half of the year there were spasmodic shortages when everyone wanted cement at the same time, but if the demand did exceed the supply in 1952, the margin was small. This opinion is based upon reports of uncompleted 1952 construction projects carried over into 1953. There are no authentic published figures available, but preliminary estimates of concrete highway and airport paving indicate that there will be approximately the same volume carried over as in previous years with paving awards in 1952 about the same as in 1951. Concrete paving is a good barometer because there is large volume and, of all construction work, this type of project requires less critical and controlled materials in relation to cement consumption than any other type of construction in which portland cement is used. The shortage of structural steel used in many highway structures has delayed completion and is, in many cases, the cause of some paving work being uncompleted. Had the industry not had interruption due

to strikes, the added production facilities supplied by the industry during the past two years would probably have been sufficient to take care of the demand as it developed.

The cement industry is not unmindful of the demands of an expanding economy which means an increase in the consumption of portland cement, and cement manufacturers are striving to keep pace with this national progress. Plant expansion and new plant construction will continue and will no doubt accelerate as critical materials are decontrolled. Plant locations are determined by the availability of raw materials and the consumer demand in the economical shipping area around the locations where suitable raw materials are available. Market surveys are continuously in progress to find undeveloped raw materials close to the markets, as freight is an important factor in the ultimate destination price of portland cement.

No Price Advances Reported

Although labor and material costs continued to rise during the year, there was no increase in plant prices reported during 1952. Portland cement still remains one of the lowest priced of any processed or manufactured material—selling at an average price of less than three-quarters of a cent per pound. Delivered prices, however, increased again in 1952 due to an increase in freight rates. The Bureau of Transport Economics and Statistics of the Interstate Commerce Commission estimated on June 13, 1952, an over-all 85.4 percent increase in freight rates on cement since June 30, 1946. Cement is a heavy commodity, and the distance it can be transported economically is limited. In the face of periodic freight rate increases, cement users are equipping

themselves to make truckload deliveries in bulk. Truck delivery of cement is fast, economical, and is continuing to increase. With the modern type of bulk hauling equipment being used by some truckers specializing in cement trucking, unloading is accomplished by a 10-in. screw conveyor in the bottom of the tank. The speed of the screw is regulated to the speed of the elevator or conveyor carrying the cement from the tank to storage.

Manufacturing Developments

While there have been no drastic changes in the basic process of cement manufacture during the past few years, there have been noteworthy developments. These developments have generally been improvements which

have resulted from the pressure of rising labor and material costs. Improved equipment and methods have been adopted in various phases of cement plant operations.

Beginning in the quarry, we find a number of rotary blast hole drills replacing the conventional churn drills with economies resulting from the higher drilling rate of the rotary rigs. Instantaneous blasting is giving way to methods using milli-second delayed blasting which reduce the magnitude of vibrations. This type of blasting is being done in two ways. Delayed blasting machines incorporate a timing mechanism which detonates the charges in individual holes successively at intervals of fractions of a second. This same effect is obtained through

the use of milli-second delay connectors. A wiring hook-up using these connectors can be made in about one-quarter of the time required for a blasting machine hook-up. Secondary breakage is being accomplished in some quarries through the use of drop ball machines. This procedure eliminates pneumatic hammer drilling and secondary blasting.

A recent development in the clinker burning department is the installation of insulating refractories. In the past, blocks of insulating material were used under the lining, but the refractories now being used in some locations have the insulating properties provided in the composition of the brick itself. Where the moisture content of raw materials is too high for in-the-mill drying, dryers using waste heat from kiln gases are becoming increasingly popular.

Material handling facilities are also being improved. A good example is the adoption of flexible, retractable conveyors used in box car loading of packaged cement. Mechanization in this operation has long been overdue.

The modern fork lift is another material handling device now being used in maintenance operations as well as in the manufacturing process. Originally introduced primarily for handling palletized materials, the fork lift truck has now become an essential piece of maintenance equipment. These trucks handle repair parts to the point of installation and elevate them to required positions, thereby speeding up repair jobs.

Change Maintenance Concept

The entire concept of cement plant maintenance is undergoing a change. More and more, the industry is adopting plant engineering as a means of properly maintaining plants and equipment. "Breakdown maintenance" is being replaced by systematic maintenance under "preventive maintenance" programs. These programs give management effective control of maintenance costs through scheduled inspections, regular servicing and budgetary accounting of man-hours. With this modernizing of maintenance methods comes improved maintenance techniques. A good example is the use of centralized lubrication systems on both stationary mill installations and mobile yard equipment. These systems are effectively improving costs by the reduction of required man-hours for lubricating and lowering of repair expense on the equipment so lubricated.

Electric welding has long been an indispensable tool in cement plant maintenance. The development of submerged arc welding is now recognized as a money saver in this industry where abrasion and corrosion cause fast wear of processing equipment. Submerged arc welding provides an



Such large quantities of portland cement are used in highway construction that projects contracted provide good barometer for cement manufacturing industry



Drop-ball cranes are being used in quarries for secondary breaking



Truck delivery of cement is fast, economical and increasingly popular

efficient means of rebuilding badly worn parts which previously went to the scrap pile.

Better selection of engineering materials is also assisting in reducing operating delays and maintenance expense. The industry is utilizing modern metallurgical developments in selecting materials subject to high heat, abrasion, and corrosion.

The high man-hours required for yard functions are being counteracted by the use of mechanized equipment. The cost of manual floor and road cleaning is being reduced by the use of mechanical sweepers. Shovels and wheelbarrows are being replaced by automotive loading machines.

These examples show that the portland cement industry is alert to new methods, machines and materials which will enable it successfully to continue at high operating rates in spite of the shortage of skilled and semi-skilled labor and rising operating costs.

Safety Record Outstanding

This progressive attitude toward modern equipment and methods is also reflected in the industry's outstanding accident prevention program.

An all-time record low accident frequency rate was made in 1951 by the member plants of the Portland Cement Association. This association represents 147 cement plants now operating in the United States and Canada. After a steady decline for the past seven years, the accident frequency rate reached the all-time low figure of 4.22 disabling injuries per million man-hours of operation. This rate was 12.6 percent below the 1950 figure and 50 percent below the rate for 1944.

Cement making involves the hazardous operations of quarrying, min-

ing and blasting, the use of high voltage electric current, intense heat, and some of the world's largest moving machinery. During the past 36 years the number of occupational injuries per million man-hours worked has been reduced 87 percent. On November 12, 1952, Ned H. Dearborn, president of the National Safety Council, presented its highest award to the Portland Cement Association for outstanding service to industrial safety. The cement industry was cited as the safest of all heavy industries in 1951.

Committee Plans Program

The industry accident prevention program is sponsored by an Accident Prevention Committee of the Portland Cement Association. Often referred to as the industry's board of strategy on plant accident control, the committee represents directly the managements of more than 100 of the 154 cement manufacturing plants now operating in the United States. The safety program is based upon the facts revealed in the studies of disabling injuries reported by the member plants. Publications and materials transmit the benefits of accident analysis, impart accident-prevention technology tailored to the needs of the plants and popularized safety work at all levels in member company organizations. Special bulletins and safety posters are prepared and sent in quantities to the plants. Each year regional safety conferences for plant employees are held in strategically located cities throughout the country. Visits of Accident Prevention Bureau field men are made to individual plants requiring special help.

The cement industry has found that four types of accidents account for the most serious injuries. The four great-

est hazards are moving machinery, high places, electricity and railroad-ing. Concentrated effort is aimed especially at preventing injuries from these four causes.

An industry-wide organization can be helpful, but cannot replace individual company effort in the prevention of accidents. An organization can indicate the broad objectives, but the actual prevention of accidents is accomplished at the plant level through the cooperation of a safety-conscious management and well-trained employees. Through the joint efforts of the Portland Cement Association and individual companies, new methods and techniques are constantly being sought and developed for the prevention of accidents.





About 98 percent of the total civilian labor force was employed as of October 1952

Manpower and Labor Relations

Full Employment, High Level of Earnings and Virtual Death of WSB Mark Year

By MILES P. ROMNEY

Manager
Utah Mining Association

AS the title suggests, two subjects are involved, interlocking in many aspects, but separated as much as is practical in this review. Manpower includes numbers employed, availability of labor and contractual provisions existing between employer and employees. Labor relations include developments and trends in labor-management matters as have been supported by and as they affect the public, union membership, labor leaders, management and government.

In 1952 conditions prevailed which supported full employment of able workers in all segments of industry. However, strikes directly and indirectly disrupted continuous employment in some industries, with resulting serious economic losses to labor, management and the public.

Employment High

Approximately 98 percent of the total "Civilian Labor Force" was employed as of October, 1952, according to the December issue of "Survey of Current Business."

Employment data for December, 1951 to October, 1952, on a fair sampling of the employees in underground mines throughout the United States, show some interesting facts. The "turnover" in employees averaged about nine percent per month and the oper-

ations served by these employees reported about five percent shortage of help needed to attain full production. Broken down to the western, central and eastern portions of the country, the figures show wide differences for the several sections. Western states had about 13.5 percent turnover per month and were about 6.5 percent short on manpower. Central states had only about 2.3 percent turnover per month and were only about 0.4 percent short of manpower. Eastern states had a very low turnover of

about 2.0 percent per month but were about 6.9 percent short of manpower.

Mining operations in the central states seem to have the desirable situation of very low turnover and fully available manpower. In the east, turnover is very low, but competition for labor in a highly industrialized area might explain the shortage of available men. The west's high turnover and manpower shortage can be attributed to many factors; among them, competition of the highly paid, but seasonal, timbering and construction industries; many small, individually held farms, whose owners farm in the summer and mine in the winter; isolation, populationwise, of many of the mining areas; lack of family housing facilities at many of the "isolated" mining camps; the rapid industrial growth of the entire west attracting many away from mining; and last, but not least, the still rather common, good old western miner's habit of "booming" from one camp to another. Some mines have reported as high as 25 percent turnover in employee personnel per month.

Real Earnings Increased

The mining industry in the United States shows a comparatively high level of employee earnings for the year October, 1951 to September, 1952. Some of the comparative figures are shown below.

The value of the dollar earned has decreased only 1.87 percent while the hourly earning rate has increased 11.2 percent. The increase in hourly base rate was about 8.5 percent.

Only local railways and bus lines show a longer work week (46.3 hr), while construction, petroleum production and refining, bituminous coal, steel, and the automobile industry were some of the few having slightly higher average weekly wage and hourly earnings as of September, 1952.

Wages, pensions, health and welfare plans and vacation provisions were

	Average Work Week	Average Weekly Wage	Average Hourly Earning	Purchasing Power of Dollar Consumer Index
October, 1951	44.4 hr	\$76.10	\$1.714	54.4
September, 1952	45.9 hr	87.49	1.906	52.4

the principal items involved in negotiated contract settlements in 1952. Wage settlements followed a general pattern of about eight cents per hr "across the board" with adjustments in shift differentials and job classifications resulting in an additional cost item of from a fraction of a cent to some few slightly over one cent per hr.

Some contracts were negotiated with lower wage increases and some with higher. Most of the "across the board" increases were partially sub-

ject to approval by the Wage Stabilization Board and in some cases only a portion of such increases were "permissible" under existing WSB regulations.

A few new pension plans were developed, eliminating arbitrary retirement at 65, by providing that an employee may work beyond that age if in the company's opinion he is able to perform such work as is available. Compulsory retirement, health and welfare plans were liberalized in many instances on joint contributory basis. Three weeks' vacation on 15 years of service was included in most settlements.

Negotiations were generally "tighter" in 1952, principally because of weakening prices in the lead-zinc market. Some operations have closed because of the high wage-low metal price combination. Many others, after long continued negotiations, have not as yet reached settlement. Some districts have not reached the negotiation stage, although contracts expired many months ago, because of district-wide National Labor Relations Board elections. Carlsbad, N. M., and Coeur d'Alene, Idaho, are notable examples of the latter.

T-H Upheld

Labor relations in 1952 hinged around the Taft-Hartley Act, the Wage Stabilization Board, the general public attitude toward labor legisla-

nature of amendments to be considered is not yet clear, but publicity on that matter to date indicates that correction of inequities and provisions to facilitate handling of cases by NLRB will be major considerations. Senator Taft recently expressed concern about the effectiveness of the national emergency strike provision of the law, stating, "If nationwide strikes cannot be dealt with in any other way, we might have to consider a limitation of nationwide bargaining, to prevent monopoly in labor as in industry." Representative Lucas of Texas had this in mind in a bill presented, but which failed to pass, the 82nd Congress. It is understood he proposes to present it again to the 83rd Congress.

The recent election, considering the campaign expressions of labor leaders, administration officers and administration candidates favoring repeal, at least indicates that the public, including many union members, generally favored the Taft-Hartley Act. The administration's refusal to use injunction provisions of the Act in the steel strike very probably tried the patience of the public as well as that of those directly involved, and thereby contributed to stronger public approval of the law.

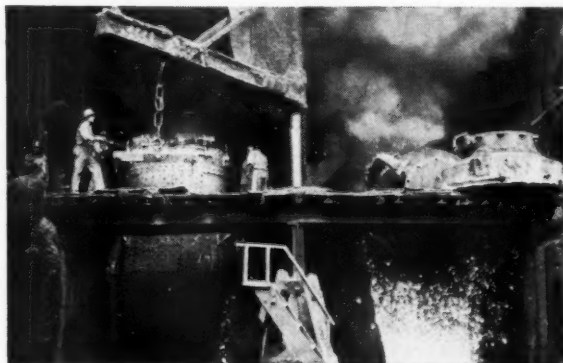
Death Knell of WSB

The WSB reached its zenith early in 1952 when through stubborn, heedless use of its great "dispute settle-

made recommendations beyond those regulations and even greater than anticipated by labor; the Utah Dispute Cases, in which the Board not only refused to consider the underground mining industry's normal district relationship wage pattern, but in its decision reversed long established precedents are but examples of decisions made which resulted finally in disintegration of the Board.

It is interesting to note that the Steelworkers were the recipients of such largesse in both the Steel and the Utah Dispute Case decisions. As predicted by many at that time, such selectively favorable consideration raised a "competitive red flag" for other representative unions in the mining industry. The other unions had, for the same contract period as was affected by the decisions, "voluntarily" negotiated continuing contracts in many mining areas at lower wage increases than those recommended by the Board in the above two cases.

The final curtain to the Board as a unit was rung down by President Truman's reversal of the "soft coal" decision. Industry members, wearied of the farce, resigned. General Order No. 19, issued December 15, by Roger L. Putnam, E.S.A. Administrator, revived the corpse by appointing the public members of the Board to "The Wage Stabilization Committee," with limited powers designed to consider "approval" requests and to so function until "The Wage Stabilization



Rapid industrial growth in West caused a shortage of experienced miners



President's reversal of "soft coal decision" sounded death knell for WSB

tion, McCarran Committee investigations, and the struggle of rival unions for certification.

The Taft-Hartley Act has been a target for repeal by labor leaders and administration officials since its inception, but has at least received at least oral acceptance by American Federation of Labor officials. Amendment is admitted by those officials as the practical alternative to repeal. Amendment is recognized as desirable by incoming administration leaders, by Senator Taft and by the new Secretary of Labor, Martin P. Durkin. The

"ment" power it illustrated for full public view and appraisal its basically, biased composition and policy. These conditions were inherent characteristics of the "compromise board" as set up following labor's walk-out on the original WSB early in 1951. Its history since has been highlighted by regulations and decisions indicating pressure of both labor and government for wage increases far beyond the cost of "living" regulations Nos. 6 and 8, largely for the benefit of major union groups.

The Steel Case, in which the Board

Board is rendered operative by appointment of members representative of business and industry."

The McCarran Committee has continued to "spotlight" suspected Communistic control of some labor unions. The hearings in Salt Lake City, October 6, 7, and 8, in which Senator McCarran was assisted by Senator Arthur V. Watkins, Utah's senior senator, consisted of one day of executive sessions and two days of open hearings. Many top officials of International Mine, Mill and Smelter Work-

(Continued on page 61)



Rubber-tired jumbos with long shell feed, tungsten carbide bits, and heavy drills provide a hard-to-beat combination

Underground Metal Mining Progress

Continued Search for Lower Costs Through Higher Unit Output Marked 1952

By PROF. S. H. BOSHKOV

School of Mines
Columbia University

A PREVIEW of what will be required of the mineral industry 25 years from now was presented last year to the American public by the President's Materials Policy Commission. Although the validity of many of the forecasts made can only be proved by time, other statements in the "Paley Report" echo what mining men have known for many years: "the industry will have to mine deeper and cheaper and learn to make economic use of lower-grade deposits if it is to contribute its share in preserving our high standard of living." More and more tons per man day at a lower cost is the answer.

Mine management is acutely aware of the shortage of experienced, skilled labor and the high price it commands. This can be paid only if the industry sees to it that maximum, intelligent use is made of this commodity. On a power basis alone, man is completely outclassed by the machine. The average mine worker cannot be expected to put out more than one hp-hr of

useful work per eight-hr shift. With a wage of \$15 per day and power cost at 1.5 cents per hp-hr, the advantage of the machine over the man is in the ratio of 1000 to 1. The advantage multiplies with the size of the machine and the efficiency of its performance. Man should not be called upon to perform tasks which a machine can do.

The trend toward large equipment is clearly apparent in open-pit operations. The problem of introducing bigger equipment underground is not so simple. Size of openings exercises a definite limitation and an increase in equipment size may call for modifications in the mining method and the loading and transportation systems. A knowledge of underground pressures and ways to control them is necessary for the design of underground openings of maximum size. Research work along these lines is conducted by universities and the U. S. Bureau of Mines.

To effect a lower over-all mining

cost, all productive phases of the operation must continually be improved. Requirements are ingenuity and technological growth. The former is an inherent characteristic of the American; the latter calls for research and engineering know-how. Mining is a growing, moving, constantly improving industry. It cannot afford to sit back and rely on any overnight spectacular, revolutionary changes. Its improvement has to be based on long, toilsome experimentation, often stretching over a period of years.

How mining men all over the world have been working toward lower costs and greater output during the past year is reported below in all the detail which space will permit.

Test Drilling Combinations

Drilling practice presents a confused picture and is yet trying to find the right combination to effect the lowest cost. Operators have to choose from an ever-increasing number of bit designs, alloy steels, and types of equipment. Large operators are, generally, using several types of machines and bits. They are engaged in the costly, practical, on-the-job research which eventually may lead to the right combination for each particular mine. Such studies often reveal that the use of several drilling combinations in the same mine prove most advantageous. This should be considered normal, as the variables which make up the cost per foot of hole are numerous and differ in importance with type of job. American and Canadian experience shows that the greatest application of air-legs and detachable tungsten-carbide bits lies in stoping and raising, the lighter equipment finding favor in

flat-back shrinkage stoping, flat-back cut-and-fill and square-set mining. Single-use bits find uses in stoping and raising where ground is not too hard.

Chief advantage of the air-leg lies in the ability to make rapid changes from hole to hole; that is, cases where actual drilling time is a small proportion of the time spent at the face. Steel cost per foot of hole drilled is often higher, as is the case at Homestake, but the lightweight drilling combination results in a greater production per man-shift and, therefore, better cost per ton. Costs per foot drilled are improving with experience. Recent trials of air-legs and hand-held drills in driving an 8 by 8-ft drift proved that the lightweight equipment may even replace drifters on that type of job.

Use of airleg-mounted drills working with carbide-tipped forged steel appears still to be on the increase in Canada, South Africa and Rhodesia. Four-point carbide forged bits are appearing at an increasing pace in Canada. The Hudson Bay Mining and Smelting Co. found that such bits on Ni-Cr-Mo alloy drill steel gave four to 14 percent greater drilling speed, less gauge loss and more footage before resharpener than detachable carbide bits.

The forged bit has not gained in popularity in this country. In contrast, drilling in Norway and Sweden is done almost exclusively with tungsten-carbide chisel bits forged on alloy steel rods.

Weakness in the threaded-bit connection has been one disadvantage of the detachable carbide-insert bit. Ingersoll-Rand has developed a procedure of rolling the undercut at the thread of the shoulder-drive connection of hollow alloy drill rod, thus leaving a residual compressive stress in the surface layers of the undercut.



In certain applications diesel locomotives helped lower underground haulage costs



Packaged "bombs" for blasting in finger raises save time, money with greater safety

This detracts from the severity of the tension stresses normally produced in service, and thus lengthens the life of the drill rod.

Trend Toward Alloy Steels

The small-diameter, long-lasting tungsten-carbide-insert bit calls for drill rod with a fatigue life commensurate with the bit life. The result is a trend toward smaller sizes of hollow drill steel and an increasing demand for alloy hollow drill steel. Research studies are under way to determine the effect of alloy composition on peening of rod ends, prestressing rod surfaces by flame, induction hardening or cold working. Such items as elastic limit, fatigue life, hot forging and machining are also under investigation. Crucible Steel Co.'s Park A low-carbon, high-nickel steel made a fine showing at the Iron King Mine of the Shattuck-Denn Mining Corp. Based on con-

trolled tests, alloy rods drilled 6.75 times as many feet per rod destroyed as did the straight carbon rods. The initial cost of the Ni-alloy steel is about 30 percent higher, but with better performance an over-all steel cost reduction of approximately 35 percent was obtained. "Chrome-moly" steel is considered in every way as good as the Nickel steel and superior in its forging, annealing, machine-threading and hardening properties. It is of essentially the same composition as the Swedish Coromant and Seco steels. However, the perfect alloy hollow drill steel is yet to be found.

Reports from Sweden indicate an increased trend toward use of $\frac{3}{4}$ -in. over $\frac{1}{2}$ -in. alloy steel. In some instances a 20 percent increase in drilling speed is claimed for the $\frac{3}{4}$ -in. over the $\frac{1}{2}$ -in. size; increased rod life, lower initial steel cost and decrease in explosives cost by virtue of using a 25mm bit. Figures quoted, for drilling in hard hematite containing quartzite, are: rod life—210 ft; speed of penetration—17 in. per min; rock broken per foot drilled—18.5 cu ft; explosives used—0.011 lb per cu ft.

An innovation in drilling steel, used successfully at some mines in Sweden, is the flexible steel-produced by Sandviken Steelworks. It has a rectangular cross-section $\frac{1}{2}$ in. by 1 in., employs a tungsten-carbide chisel bit and is used in jack-hammers with solid chucks. The steel is used in sublevel caving operations where lack of room necessitates bending the rod to get it into the hole. Due to excessive whipping it does not drill successfully in lengths of over 20 ft.

Coupled Rods for Long Holes

The use of rock drills, coupled rods and carbide bits for long-hole drilling is gaining popularity, especially in cases where rock is hard and tough.

Test drilling at the Boyd and Burra Mines of the Tennessee Copper Co. indicates that the carbide bit has a place in long-hole blast-hole drilling with a limitation in hole depth of about 60 ft. Carbide-insert bits of 2½ in. diam were used with four-in. percussion drills. This conclusion is supported by experience in the Noranda area where holes up to 105 ft long have been drilled by this method. Drilling efficiency fell off when holes were over 70 ft deep but this may have been a result of insufficient power in the drills.

Jumbos are still in favor in places where driving speed warrants their use. Stiff competition will be offered the jumbo by airleg drills in small headings. In large headings, however, and with recent improvements in the quality of tungsten carbide enabling it to stand up better with heavier drills, the rubber-tire-mounted jumbo with the long-shell feed has proved a tough combination to beat.

Drill manufacturers are constantly trying to improve their products. Competition in the field is stiff and a great deal of attention is paid to detail in trying to ease the job of the miner and enable him to produce more with less effort. Le Roi's offset telescopic leg stoper features convenient location of controls. The self-leveling mine jumbo has offset arms which provide ample clearance to drill lifters, without having to take time out to swing the drill under the arm. Airlegs on the market mount drills which can be used as stopers, drifters or sinkers. Where wet drilling is difficult, dry drilling can be effected through the use of the Holman Dryductor or the German Königsborn Exhauster.

New Aids in Blasting

The Hercules VAO blasting meter and the Du Pont portable, condenser-discharge type blasting machine are recent aids in blasting. The former can be used to check stray currents around blasting operations in addition to its use as a blasting galvanometer. The latter, manufactured in two models, claims exceptionally high capacity and suitability for every conceivable type of blasting job. The larger model has a capacity of 50 caps in straight series primary blast, 200 caps in straight series secondary blast, 50 caps in straight parallel, and 1200 caps in parallel series (30 series of 40 each).

The shaped charge, after streaking to prominence in the early years after the war and thereafter fading out of the picture, has again put in an appearance in open pit work. The Shaped Charge Explosive Manufacturers, Inc. is offering a new design, the Plurajet, in five different sizes. As yet it has not been offered for underground work.

American Cyanamid has come up

with an interesting package in their "Gelpack" which is used in mud-capping and blasting finger hangups. The pack consists of 40 percent straight gelatin in a plastic bag and is offered in ten, five, two and one-lb sizes. A metal ring on the pack permits quick and easy placement and withdrawal of the pole in finger work. Greater area contact of explosive and rock, conducive to more efficient powder utilization, is claimed. Fume balance is normal and a cap punches through the plastic readily, precluding direct physical contact of the miner's skin and the explosive. Controlled tests at an eastern iron mine showed a substantially lower powder factor and increased productivity with the use of the new pack.

Innovations in Haulage

The bulk of the broken ore is still transported by trolley locomotives. Conveyor belts are gradually invading the metal mining field. Diesel-powered trucks and locomotives are gaining steadily. The latter have a good

non-metallic mines indicate that belt life is greater than was expected. Their use, however, is still limited in many cases due to mining method used. At present they are used in copper, iron, gold ore, bauxite, potash, limestone and coal mines. Though not applicable in every instance, belts should be definitely considered in any new installation. Belt life cited, handling copper ore, ranges from 20,000,000 tons on a 7000-ft system to 100,000,000 tons on 60-in. belt of 1500-ft travel. Pend Oreille's incline conveyor proved that an inclined shaft equipped with belt can do better than a vertical shaft and hoist. The conveyor system handles 800 tons of ore daily over a 2700-ft length of belt, at angles of 10° and 17°. This output is handled with one man in two hours. A similar job at the company's Josephine mine required 20 men and two shifts. The belt transports ore at a cost of six cents per ton, with an expected reduction to four cents per ton when production reaches 2400 tpd.

A revolutionary departure from conventional types of conveyor drives has



Model mining communities are important aid toward better labor-management relations

chance for displacing batteries and trolleys in some applications as improvements in elimination of exhaust gases are effected. Diesel units are flexible and self-contained, and servicing is simple. Operating cost as well as first cost is usually lower. At the Falcon-bridge Mine in Canada a six-ton Diesel locomotive effected a 34.5 percent saving in operating cost over a three-ton battery locomotive. On a recent backfilling job at the Quemont Mine, a 36-hp, six-ton Diesel unit hauled 60,000 tons of fill over a period of two months at an operating cost of 3.9 cents per ton.

Performance of belts in metal and

been introduced by the Iowa Manufacturing Co. It consists of a fabricated steel head pulley with the electric motor, reduction gears and all moving parts contained inside the drum. Savings of 70 percent to 90 percent of down time are claimed, by elimination of all countershafts, speed reducers, sprockets, chains, universal shaft drive and other parts necessary with conventional pulley drives.

Chute loading still predominates in the United States but attendant troubles have pointed up the desirability of eliminating chutes. In many cases broken rock is dumped directly onto the haulage levels where mechan-

ical loaders can pick it up. This practice usually breaks a bottleneck and permits cheaper handling. The scraper and slusher loaders are used extensively both in flat and inclined stopes. Mechanical loaders are mostly the overhead type. These are also used effectively in inclined shaft-sinking operations. Two compressed-air-powered loading machines were used to sink a 12-ft by 8-ft, 26° incline below the 1400-ft level of the Ophir Mine of U. S. Smelting Refining and Mining Co. Both skips in the two-compartment shaft were utilized and an average of 10 to 12, 1½-ton skips were loaded each hour.

Rubber-tired and crawler-mounted loaders are finding increasing use in hard rock mines. Diesel-powered shuttle cars and tractor-trailer units haul big tonnages in some mines which can accommodate that type of equipment. A cost of 6½ cents per ton-mile over an average haul of 2850 ft is reported by one operator using diesel shuttle cars.

Mechanization Pays Off

An expansion program costing upwards of two billion dollars is under way in the mineral industry of this country. Demand for minerals is increasing, but so are costs—particularly labor. Therefore considerable expenditures for equipment, supplies and power are justified to increase the unit output per man-shift. The future should see greater mechanization of underground operations with attendant revisions in mining methods to insure maximum return from the expansion and modernization of equipment. By introducing modern equipment during the past decade, as well as by planning and ingenuity, the Hecla Mining Co. is effecting a yearly saving of over \$250,000. The Tennessee Coal and Iron Division of U. S. Steel Corp. realized maximum haulage capacity and eliminated delays in rerouting locomotives through the use of a carrier current telephone intercommunication system. The International Minerals and Chemical Corp. has effected a 20 percent increase in tonnage hoisted at its Carlsbad, N. M., property by converting its semi-automatic high-speed hoist to a fully-automatic one.

Progressive operators constantly try new wrinkles that will enable them to cut corners and increase mileage of tools used. Liquid Neoprene coatings saved a severely cavitated mill tailings pump and a badly corroded mine pump from the scrap heap at Calumet and Hecla. About 1/3 of the single-use bits are repressed to give another usage in South Africa, thus lowering consumption of new bits by over 20 percent.

Multi-purpose units are invading underground mining. The Rogers Iron Works Co. of Joplin, Mo., is making



Better ventilation improved working conditions

a self-propelled folding-mast unit, useful for drilling, powder loading, scaling, roof bolting and timbering operations. Mobile compressor units may be expected to become common underground, especially in mines of large areal extent where installation, maintenance and moving of compressed-air lines in routine mining is a growing problem.

An innovation in mining procedure is being given a trial by the Westvaco Chemical Corp. at their trona mine in Wyoming. Portions of the roof and/or floor of mined areas are blasted into the opening, the fragmented rock completely filling it. This procedure, designed by P. B. Bucky of Columbia University, may result in reduced cost of filling stopes, increased ore recovery and greater safety.

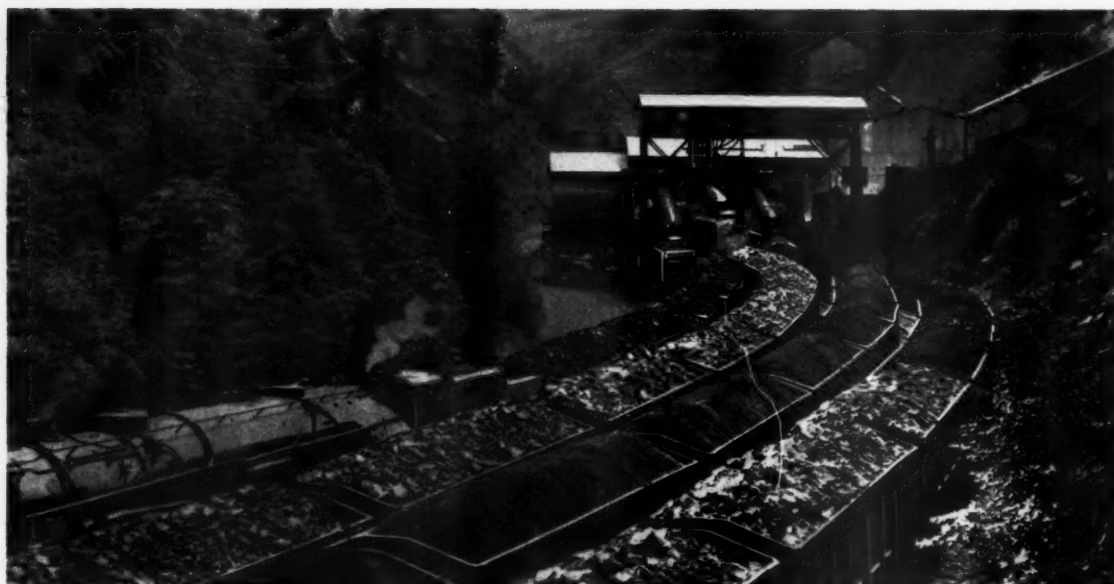
Labor Relations Improve

Last, but probably most important, is the trend toward closer and friendlier labor-management relations. With the expansion in number and size of machines in mining, it is becoming

increasingly more important that the man behind the controls is kept happy and willing to be as efficient as the machine. Companies are realizing that improvement in working and living conditions often obtain a greater return in production than improvements in equipment. An employee will enjoy his work more, produce more and be loyal to his company, if he takes pride in it and knows that his employer tries to improve the environment in which he works and takes a deep interest in his personal well-being. Andrew Fletcher, president of the St. Joseph Lead Co., ascribes the 50 percent increase in the output of the company's mining operations to a greater degree on improved morale than on improved equipment. By inaugurating a progressive attitude in safety and hygiene, the company has been able to reduce its labor turnover from 250 percent in 1918 to 12 percent in 1949 and eight percent in 1951. Many companies will profit if they improve working conditions and show greater interest in the men they employ.



Fork lift trucks not only handle packaged timber but also help in maintenance work



Productive capacity exceeds coal demands by over 50 percent

Bituminous Coal

Increased Competition, Freight Rates, Lower Production Hard Blows for King Coal

By C. J. POTTER

President
Rochester and Pittsburgh Coal Co.

BITUMINOUS coal began a major slide down hill in 1952. Beset by the laborless fuels, higher transportation, labor and supply costs, inability to cash in on a more favorable percentage depletion rate and feeling higher local and state taxes, King Coal came out of Round two of the postwar softenings in many industries a bit groggy.

With production off 70,000,000 tons from 1951 and prospects for a further decline in tonnage in 1953, together with coal industry profits approaching the zero point, a revolution in coal mining must of necessity be in the making. Financially stronger segments of the industry have or nearly have completed major mechanization and preparation programs started after the war and these companies are finding that the labor costs in many cases come to less than 50 percent of the total cost of production at the mines. The financially weaker elements in the industry have turned to either opportunist methods of mining or have all attempted to operate non-union or else closed. Large segments of production are entirely non-union

and seem to be growing in spite of United Mine Workers attempts to unionize these areas.

Excluding mechanization and its allied phases, the following is the status of bituminous coal at the end of 1952.

Stocks and Production

Bituminous coal stocks were expected to be near 75,000,000 tons as of January 1, 1953. While generally this immense tonnage is thought to be

grossly excessive, actually it is not when measured in terms of days of supply normally held for particular industries in view of the shift and percentage consumption of coal consumers.

Coal's peak production was over 630,000,000 tons in 1947 and it appears that in 1953 the production will hardly exceed 455,000,00 tons or a drop of almost 28 percent from the all-time high.

An accompanying table shows the estimated coal production and consumption in 1953 and 1952, compared to that of 1951.

Labor Relations

The coal industry was free from general strikes in 1952, except for one week. The United Mine Workers, bargaining agent for about 80 percent of the bituminous coal industry, in conformance with its contract, served a termination notice on the industry east of the Mississippi River, effective September 30. The Bituminous Coal Operators' Association at that time

CONSUMPTION AND PRODUCTION, MILLIONS OF TONS

	1953 (Est.)	1952 (Est.)	1951 (Actual)
Electric Power Utilities.....	104.0	102.0	101.9
By-Product Coke Ovens.....	103.0	90.0	102.0
Bee Hive Coke Ovens.....	7.8	7.5	11.4
Steel and Rolling Mills.....	7.2	6.8	8.0
Cement Mills.....	8.0	8.0	8.5
Other Industrial.....	95.0	95.0	108.0
Railroads.....	34.0	38.5	57.0
Retail Deliveries.....	65.0	70.0	76.5
Bunker.....	0.7	0.8	0.9
Exports.....	35.0	48.0	56.7
Indicated Consumption.....	459.7	466.6	530.9
Stocks (decrease or increase).....	-4.0	-2.0	+4.0
Indicated Production.....	455.7	464.6	534.9

signed a contract to pay \$1.90 per day wage increase and 10 cents per ton additional to the Welfare Fund. On October 18, 1952, the Wage Stabilization Board chopped off 40 cents from the \$1.90 increase, in spite of the fact that both management and labor had agreed to eliminate such fringe benefit increases as vacation pay, holiday pay and shift differentials in effect in nearly all other major industries in an amount greater than the 40 cents per day.

The mine workers struck for a week until the President stated that he would see that the mine workers got a square deal. The operators and mine workers appealed to Economic Stabilizer Putnam, who attempted to put the additional 40 cents per day in terms of fringe benefits, but neither of the two parties would agree to this. On December 4, 1952, the President approved the contract as negotiated by the interested parties.

It was stated by the UMWA in a letter to the Wage Stabilization Board that the increased benefit payments were intended to maintain benefits at their present level and not to increase services.

It has been argued since October 18 that the new wage scale would force many mines out of existence and this has been borne out. Employment in and around the mines is at a 20-year record low level but productive capacity still exceeds all possible demands by more than 50 percent.

Atomic Energy

The coal industry, as probably many others, is a bit bewildered by the claims and counterclaims of various scientific factions.

It is significant, however, that new coal fired steam boilers to use 20,000-



The bituminous coal stockpile of 75,000,000 tons is not excessive

000 tons of coal are under contract to supply electrical energy for atomic plants.

It is readily admitted by the most rabid proponent of atomic power that if electricity from this source was placed on the bus bars at a central power station, free of all charges, the savings to an electric consumer would be in the order of only 25 percent.

The argument between the coal industry and the proponents of atomic power are similar to that between coal and certain public hydroelectric developments. In the latter cases, a major portion of the cost is attributed to flood control and navigation and a minor percentage to the cost of power. In the case of atomic power, a terrific quantity of heat is generated in the manufacture of plutonium and it is being argued that anything that can be obtained as a by-product from the

militarily valuable plutonium manufactured should be sold at any price to reduce the cost of plutonium. This would permit the delivery of electricity to the bus bars at a price approaching zero if it was expedient to do so without regard to the Nation's economy. Obviously, the coal industry would take a very dim view of this type of accounting and economics.

Freight Rates Upped

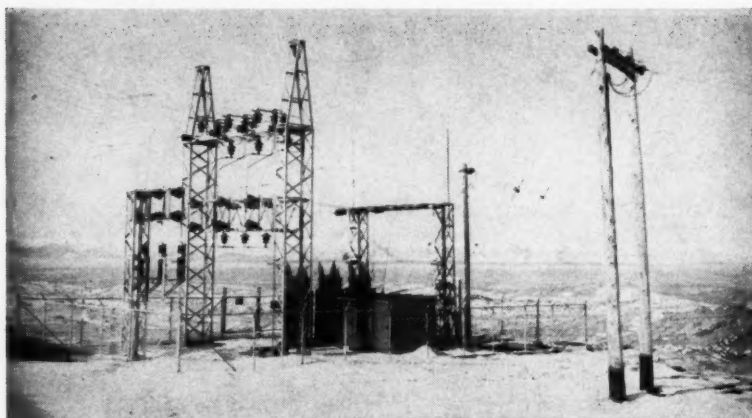
On May 22, 1952, all coal rates, with the exception of certain intrastate rates commented on later, were increased six percent or a maximum of 20 cents per ton. This meant that in general, with the exception of a few short haul rates, the increase of nearly 20 cents, for the average rail freight rate on coal in 1951 was over \$3 per ton. This increase amounted to about 0.8 cent per million Btu to consuming points for the generation of steam.

Ohio did not permit any of the six percent increase in 1952 nor did it permit the previous six percent allowed earlier to go into effect on coals originating in Ohio. Neither Indiana nor Kentucky have permitted the last six percent increase on coals moving entirely within the states' borders. Virginia and West Virginia have made a series of exceptions to the last six percent increase.

State regulatory bodies and the coal producers in the short haul markets are complaining about the methods of increase. For example, differentials between competitive districts have not changed appreciably since before the war, in spite of the high cost to the railroads of hauling differentially related coal. This therefore penalizes the short haul districts as much as 40 cents per ton, particularly in view of the tremendous increase in cost of producing coal in the differential districts. The consensus is that these cases will probably end in the courts and there exists a strong possibility



Operators granted a \$1.90 per day wage increase, only to have it cut back by WSB and then restored by the President



Even if electricity from atomic power plants were put on power lines free, savings to the consumer would only be about 25 percent

of a request for legislative action in this matter. This is particularly true in view of recent court cases that allow the carriers and the Interstate Commerce Commission to consider the huge passenger deficits when making other rates. The passenger deficit is on the order of \$1 per ton on all coal hauled by the railroads.

It must be noted that coal trucked in the past five years has increased 25 percent and, for all practical purposes, the railroads have priced themselves out of this particular market.

Coal vs. Hydroelectricity

In 1952, the coal industry opposed Federal financed power projects that pay no taxes and sell some power at prices less than the taxes paid by public utilities. The coal industry has not in its entirety opposed hydroelectric power installations provided by private power companies not financed with Federal funds. The coal industry has seen the migration of industry to areas providing cheap tax-free Governmental power and the result has been particularly unpleasant in many of the coal producing areas that formerly supplied these plants. The coal industry is perfectly aware that in time hydroelectric developments will eventually lead to a higher standard of living and, therefore, to an increase in the quantity of coal consumed. The industry still objects however, to the use of its own tax money to help put it out of business.

Competition With Oil

Importation of residual oil in 1952, principally for consumption on the eastern seaboard, has reached the staggering equivalent of over 30,000,000 tons of coal. This is an increase of over 100 percent in five years. The economic effect on certain portions of the coal industry obviously is extremely adverse while the increased loss in revenue to the railroads amounts to over \$100,000,000 per year.

The coal industry was not appre-

hensive of residual oil from petroleum produced in the United States, but became quite resentful of the fact that the importers sell the products really needed in the United States to foreign sources and dump the residual, which is not economically needed, to coal consumers here. All of the petroleum products described above are refined outside the United States.

The contract price of residual on the eastern seaboard is about one cent per million Btu less than the price of the higher grade coals and one cent per million Btu higher than the low grade coals. Spot prices are whatever the

importer needs to force the dumping of the oil and these spot prices have varied from the equivalent of \$10 per ton to a low of \$3.50 per ton on Pennsylvania coal f.o.b. the mines. Obviously, coal cannot compete with this foreign residual, and in 1952, the coal industry started taking steps to force a solution to this unrestricted foreign competition.

The Natural Gas Problem

During 1952, coal could not compete with interruptable natural gas for it was delivering as much as five cents per million Btu or the equivalent of \$1.30 per ton less than coal. It is believed, however, that superior uses (not steam boilers) will, in a few years, eliminate natural gas for inferior use. The Federal Power Commission is slowly moving in this direction, but more important, natural gas distributors are storing this commodity near the superior users in the summertime rather than dump to steam boilers. Much higher prices for superior uses makes this attractive. The coal industry is still objecting seriously to its loss of markets but is heartened by the activities of the natural gas distributors in storing their products. Coal in general does not support the policies of the FPC in holding gas prices at such a low level that many natural gas distributors are not earning a proper rate of return on an investment which has been primarily financed by bond issues.

British Coal Prospects for 1953

By E. ROSE

Until recently an official of
Britain's National Coal Board

NINETEEN fifty two in Britain's coal industry has been described as a "sowing year" by the chairman of the National Coal Board, Sir Hubert Houldsworth. He prophesies that 1953 will be a "reaping year."

Production went up during 1952, though the increase in deep-mined output was small. Exports and stockpiles were also up. The number of boys under 18 joining the industry was the largest since 1939, a significant and hopeful development.

Total output for 1952, deep-mined and strip-mined was approximately 225,000,000 tons, compared with 222,500,000 tons the previous year. Deep-mined output was 212,500,000 tons

and strip-mined 12,000,000 tons, an increase of 1,500,000 tons deep-mined and 1,000,000 tons stripped. This year total output may reach 230,000,000 tons.

Doubtful factors are, the effect on production of the second week's holiday with pay which the miners are to have for the first time in 1953, the continuance of Saturday morning shifts and how much discontent there is about wage claims.

A number of miners took an unofficial second week's holiday in 1952, so that there was already some loss for that reason. The miners are not expected to give up the Saturday morning shift, as they need the money. The National Coal Board is working hard on a new wage structure for miners, and part of the scheme should be

ready by March. But agreement on this thorny problem is going to be difficult to achieve.

Labor Supply Increased

There were 720,000 miners on the colliery books at the end of 1952, compared with 698,600 in 1951. It is hoped that numbers this year will be between 725,000 and 730,000. Over 26,000 of the new recruits were under 18.

The fact that so many boys from the mining areas are deciding to be miners is a great tribute to the progress made since nationalization. Mining has its hazards, but jobs are permanent and pay is good. The national average wage for all English coal miners in mid-1952 was \$30.45 a week, compared with \$20.62 for other industries. At the coalface, weekly average wage is \$35.36. Prospects for promotion for the bright boy are good, welfare facilities are much improved and there is now a contributory pension scheme for miners over 65. Miners are also exempt from military service.

As a further inducement to men to go into the industry, the Board has set up a Housing Association to supplement the building schemes of local authorities in mining areas. The aim is to build an additional 20,000 houses for letting to new recruits and miners who are badly housed. Building started last April and will be concentrated on good productive areas where recruits are especially wanted.

The increase in production in 1952 combined with a decrease in home consumption of about 3,000,000 tons benefited Britain's home stocks and exports. During the summer, stocks were built up to over 19,000,000 tons. For the first time for a decade, Britain entered the winter without fear of a fuel crisis.

Higher Export Target

Coal exports and bunkers were increased to about 16,000,000 tons, compared with 11,500,000 tons the previous year. Had the Government given the signal earlier in the year to export more coal, more could have been sold. The export target has been set higher for 1953.

Reorganization of old pits and the opening of new ones are the most dramatic features of the national plan for coal. Since a colliery takes anything from two to more than ten years to reconstruct, most schemes begun by the Board have not yet been completed. Coal begins to come from a new colliery five or six years after shaft sinking has begun; output then gradually builds up over the next five or six years.

The first of the major new mines, Kingshill No. 3 Colliery, in Lanarkshire, Scotland, was completed and

brought into commission early in 1952. It was started before nationalization. Already it is nearing its output target of 1200 tons daily and is making a valuable contribution to the coking coal requirements of steel makers. Calverton Colliery, another pre-nationalization mine, in the East Midlands of England, also started production in 1952. In Scotland alone, work was commenced on the construction of four large new collieries. When in full production, annual output from the four combined will amount to 3,500,000 tons. New drift mines have also been opened.

Mechanization Troubles

Adapting machinery to the different underground conditions calls for trial and experiment over a number of years. In Britain, 89 percent of coal is mined by the longwall method where complete mechanization is much harder

than in room and pillar workings. Difficulties of roof control make power loading also difficult. About 81 percent of deep mined coal is mechanically cut and nearly 88 percent is mechanically conveyed. The amount of coal power loaded has increased from 2.6 percent in 1946-7 to 4.6 percent. There are now some 100 Meco-Moore cutter-loaders in United Kingdom mines, and other cutter loaders are being tried out.

During 1953, the Dosco Miner, a Canadian cutter-loader, will be given trials in Britain. It works on the same principle as the continuous miner but is designed for Longwall faces instead of room and pillar workings. A new cutter that will be tried out in strip-mines is the auger, a United States machine which works on the boring principle. The Marietta miner will also be tried out in the hopes that it can be used in driving roadways.

Manpower

(Continued from page 53)

ers Union were questioned about Communist party affiliations or activities. Each refused direct answer on the ground of "privilege of the Fifth Amendment." The hearing data was released to the public December 29. Contempt of Congress charges or prosecution by the Justice Department are possible further actions against those questioned.

Voters Restore Balance

Public opinion cultivated by free speech and protected by the secret ballot can properly be likened to erosion of the earth's surface. At times it is slow in action, almost to the point of being imperceptible, again acting like a flood. Public opinion is the great underlying force in our law making and law enforcement practices. The Anti-Trust laws, the Wagner Act, the rise and fall of the Volstead Act, and the Taft-Hartley Act are but examples. An editorial in the December 8 *Wall Street Journal* clearly states the principle in the following brief quotation:

"The men who shaped our anti-trust laws were not the politicians in Washington. Those laws were created by the men who did certain things that made the anti-trust laws necessary.

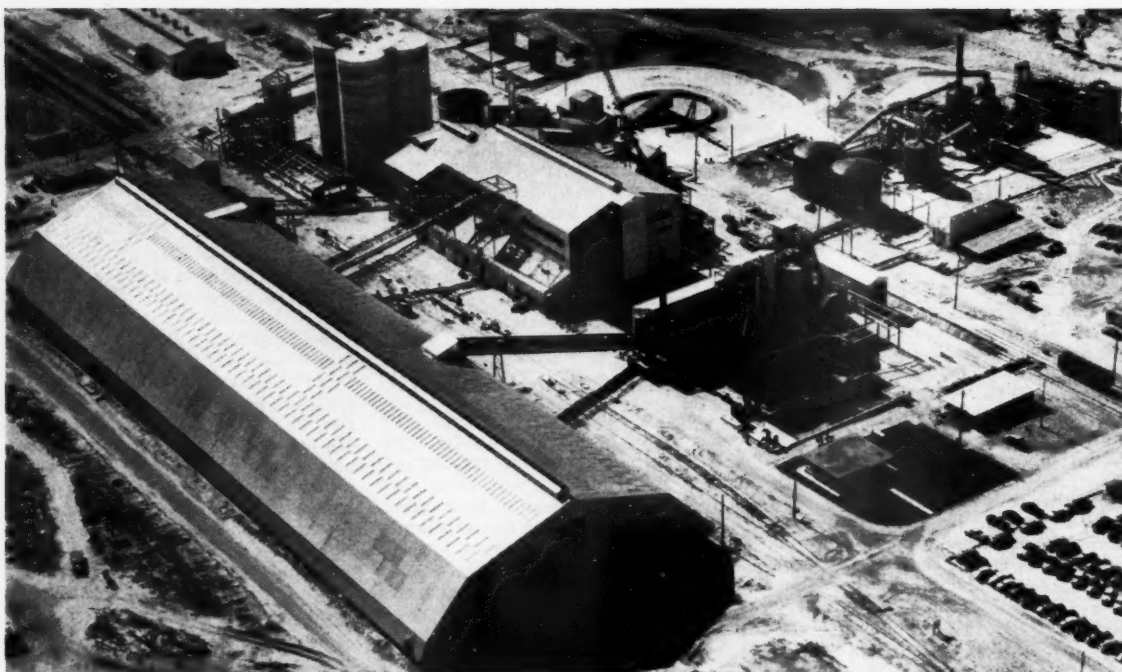
"Senator Taft, for all his acumen and influence, did not create the law that bears his name. Had the actions of some men not overreached for power, Mr. Taft would probably never have thought of the law and could not have gotten it through Congress if he had. . . . The Taft-Hartley Act came because the environment in which unions live had changed and the leaders

kept acting as though it had not. . . . We hope they will be wise enough to remember that Americans do not long endure overreaching power from anyone without rising up to redress the balance."

The secret ballot is our most effective means of expression to attain over-all justice, the best protector of democracy. Would not the unions become more democratic, more a means of expressing the will of the members and a better tool for the realization of their welfare, if the secret ballot, under proper supervision, could be made mandatory at the "Union Local" level in the consideration of economic matters affecting them.

Pendulum Has Swung

The greatly strengthened support of the Taft-Hartley Act increased publicity and greater appreciation by the public of the monopolistic power of the major labor unions expressed through industry-wide bargaining; the curbing by Congress of the WSB power in such matters as labor disputes and union shop; Judge Pine's clear-cut and courageous decision in the matter of the President's power of seizure, later upheld by the Supreme Court; many other lesser court decisions clarifying the law; the public criticism of the administration's paternalistic support of labor's demands, as expressed by the late Mr. Murray's expression, "Our Friend in the White House," and their endorsement of the "need for a change" in the recent national elections, all indicate that 1952 was a year of outstanding importance in Labor Relations. A year in which the ferment of public opinion worked more strongly for correction of abuses, for curbing of overreaching power and for making the same rules apply to all "participants in the game."



International Minerals & Chemical Corp.'s. new phosphate chemical plant at Bonnie, Fla., as it neared completion

Potash and Phosphate

New Orebody, Mines, Refineries, Processes Mark Potash Year. Big Expansion Program With Emphasis on Chemicals Highlights Phosphate News

By **THOMAS M. WARE**,
Vice-President, Engineering
International Minerals and Chemical Corp.

POTASH—Farmers everywhere are reaping the reward for increased use of fertilizers—particularly those high in potash content—with their improved crop yields. In an industry, 90 percent of whose product goes to fertilizing farm soils, this is bound to be the conclusion gained from a review of the impressive production records of the potash industry during 1952.

It also looks as though the farmer's important place in our economy is not as susceptible to business downturns as it has been in the past. As a result two new mines and refineries were added to the Eddy County, N. M., production scene during 1952. These new plants are built to accommodate

sizable increases in potash production as they are needed.

Keen Competition Seen

The stage is well set for strong, competition in the months ahead, because still another, one of the older producers in the basin, has announced its intention to build a sixth new mine in this field. At the same time a revolutionary, new beneficiation process has been announced by this same producer which not only will make possible lower cost production, but will eliminate the need for process water, a most serious obstacle to future potash production increases in this area.

The New Mexico potash industry

now constitutes over 90 percent of the total potash resource in this country. The original domestic source—Searles Lake—continues to be an important factor on the West Coast by reason of its proximity to markets there. But, barring any drastic upward rise in freight charges, the Permian Basin will supply just about all of this country's potash needs in the years ahead.

Set New Production Record

While the potash industry of New Mexico is barely 20 years old, potash now leads the list of all mining products for this state. In the past year's mining record, according to state inspector of mines, John A. Garcia, well over 7,000,000 tons of potash ores were produced, valued at over \$36,000,000. Estimated replacement value of the plant and equipment in this area devoted to potash production is now over \$80,000,000, no small indication of a dynamic industry, well established. New growth is being projected for this area, almost seasonally, as each company announces new plans for increased production. It is estimated that over 10,000,000 tons of potash ores will be produced from the Permian Basin in the year ahead.

Up until last May there was a deficit of potash in the U. S. A. Production in fiscal 1951 of the five major producers totaled 2,476,000 tons of salts, equivalent to 1,420,000 tons of K_2O (the universal unit basis for comparative purposes). Apparent consumption of potash for the same period, however, totaled 2,902,000 tons of salts, or 1,653,000 tons of K_2O . The deficit of 200,500 tons of K_2O was made up from foreign imports.

New Eddy County Producers

Duval Sulphur and Potash Co., the first new producer at Carlsbad since 1940, started its new plant at capacity about March, 1952. Its reported rate of production is 2500 tpd of silvinite ore. Following closely on the heels of Duval, Southwest Potash Co., a subsidiary of American Metals Co., completed its new mine and refinery near Carlsbad. Its production started in October at an announced production rate of 3000 tons of ore per day.

Foreign Competition

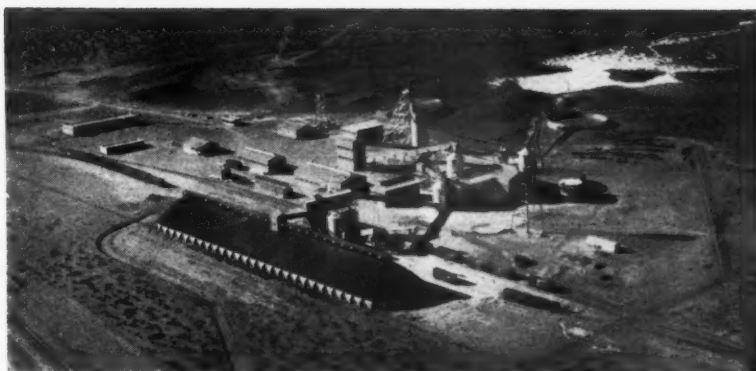
It would seem difficult for the "deficit," necessitating importations of foreign potash, to continue in the face of this new production. Dollar hungry foreign producers in government operated mines of Germany, France, Spain, and even Russia, however, seem determined to stay in U. S. potash markets. They have been able to hang on along the Eastern Seaboard where long railroad freight haulage costs from New Mexico fields permit foreign producers to offer potash on the same price basis as that offered by domestic producers.

The U. S. Department of Agriculture has issued a long term report showing that American farms will need 2,185,000 tons K_2O by 1955, and 3,000,000 tons K_2O by 1960. While domestic producers may not agree with this estimate, the long term trend continues upward.

Plants Streamlined

The new mines and refineries near Carlsbad are impressive instruments of streamlined, modern design to make any American proud of the original potash ore discovery which freed this market from foreign domination. Both new mines and refineries benefit from latest advances in mining and plant design technology. Much has been learned about mining and beneficiating New Mexico potash from the three predecessor companies—U. S. Potash Co., Potash Co. of America, and International Minerals & Chemical Corp.

Both Duval and Southwest recognized that the well-established companies had the advantages of large, extremely efficient plants, seasoned operating personnel and long experience. All of which meant they would



Duval Sulphur and Potash Co. started production from deepest mine in basin last spring at 2500 tpd rate

have to cope with very stiff competition as newcomers. Both companies built their mine and refinery combinations to be easily expandable. They have had to take advantage of every modern innovation at great expense to offset even partially the written-down values of the older plants, and other advantages of the companies, already well established in the potash markets.

The Duval Sulphur and Potash Co. is estimated to have an investment in its new potash mine and plant of about \$9,000,000. The ore body is deeper than any other in the area, 1420 ft below the surface. Southwest Potash Co.'s new mine and plant is

an investment of \$11,000,000. The mine is 887 ft deep.

Water is Scarce

Finding a sufficient long range water resource offered serious problems in bringing new potash production to the basin. Southwest Potash had to invest in a 24-mile pipeline leading east to the Caprock area. Duval's water is from the same area via a similarly long and expensive line.

Even though Duval and Southwest did manage to obtain a supply, water is short in the southwest. All water in this area is under close control by the State Engineer's office. Applica-



Carlsbad, N. M., is center of Permian Basin potash mining activities



Southwest Potash Co., another newcomer to the industry, completed its mine and refinery and began to process ore at rate of 3000 tpd

tions for intended commercial use of water must be approved by the State Engineer, and even these rights are subject to contest by previous users.

Develop Dry Process

Adding to the increased production predicted for the potash industry, International Minerals & Chemical Corp. has announced a new and revolutionary process to beneficiate potash ores. The company stated that the process involved dry separation of potash salts using a unique, patented process in which ore is passed between electrodes to effect separation. International also announced that it was breaking ground for the construction of a pilot plant near the shaft being planned for its new ore discovery in Lea County. This new discovery is expected to develop into an ore-body larger than any in the basin. After pilot plant work is completed International intends to build its No. 2 plant employing the newly developed LeBaron-Lawver process.

Among those also showing interest in adding to the Carlsbad potash production is the American Potash and Chemical Co. now taking out permits for prospecting. Freeport Sulphur Co. is developing an orebody, which it has discovered. The Farmers Union Cooperative also holds large potash ore reserves in the area.

To Expand Chemical Plant

No report on the potash industry at Carlsbad would be complete without mention of the chemical plant expansion there. International Minerals & Chemical Corp., the only producer of langbeinite ores (sulphate of potash magnesia), is making further additions to its chemical plant. A new magnesium oxide and hydrochloric acid plant is being built. Initially, 12,000 tons of high purity magnesium oxide are to be produced for use where purity is important. About 40,000 tons of 20° Baumé hydrochloric acid are to be produced, for sale, largely to the local oil industry.



Noralyn plant of International Minerals & Chemical Corp. provides centralized mining, processing, storing and shipping facilities

PHOSPHATES—The phosphate rock industry experienced another year of record production and sales. For 1952 the best guesses are that this U. S. industry, reporting from Florida, Tennessee, and the Western States (Idaho, Montana, Utah and Wyoming) will rack up a total production of over 11,000,000 long tons. Barring any likelihood of an increase in exports, the apparent consumption figure may almost reach the 10,000,000-ton mark in 1952.

What probably will not be reflected in the year-end totals will be the record construction program begun during the year. Over \$90,000,000 of new construction was announced by the phosphate industry during 1952!

Impact of this large new construction figure is fully recognized when one takes a detailed look at the individual company plans that make it up. Most of this money is going into new triple superphosphate and elemental phosphorus plants.

The phosphate industry is blossoming so fast with plant additions to its mining and rock beneficiation facilities that it is getting harder to see where fertilizers leave off and chemicals begin. Behind this whole picture, the farmer is becoming more of a chemist-economist than ever before. He wants to receive his units of P_2O_5 delivered on the farm at lowest freight cost, and at the same time he is more conscious of labor saving to be gained by using "high analysis" fertilizers.

Florida Report

As may well be expected, Florida accounts for over \$60,000,000 of the new construction during the past year. Activity in Florida is largely centered around Bartow.

International Minerals & Chemical Corp.'s \$13,800,000 Bonnie Chemical Plant at present is the largest new plant addition. This plant will process approximately 240,000 tons of phosphate per year, primarily a phosphate animal feed additive. Some multiple superphosphate will be produced for use within the company. Some uranium is expected to be produced as a by-product of this new plant operation.

A novel wet process is used. New products will start coming from this new plant shortly after March, when it is due to be running.

A certificate of necessity has been granted in the amount of \$7,700,000 to International for the construction of a new phosphate mine at the New Phosphoria properties. Another certificate of necessity has been obtained to provide additional mining capacity with the purchase of a new 1250-B dragline for \$1,200,000.

International also has completed its new ultra-modern analytical laboratory for assay and plant control work. This new laboratory at Noralyn is expected to make possible improved

standards of quality control reporting. It represents the last link in the establishment of an ideal mining to customer processing system. Its completion follows the construction of the company's \$500,000 maintenance service center, also at Noralyn.

Virginia-Carolina Chemical Corp.'s biggest addition to operations will be its new \$5,000,000 triple superphosphate plant at Nichols. V-C has not stated whether it will produce uranium here, but according to local reports, it is expected that by-product uranium will be produced. Only preliminary construction work has been carried on to date. Work is now starting on foundations with steel erection expected to start in three months.

V-C has also revamped its wet storage, drying, grinding and shipping center. Over \$2,000,000 is being spent in this program. Wet rock storage was increased and modernized by installing a conveyor, wing type stacker to store 400,000 tons on the ground.

U. S. Phosphoric was pilot planting "... a technically feasible process to determine the operating characteristics of uranium recovery methods ...", so it can be assumed that this company may soon be making further additions to its plant.

Victor Chemical Works' activity at their elemental phosphorus producing plant, near Tarpon Springs has been devoted to the elimination of dust. Over \$125,000 has been spent on gas scrubbing and dust collecting equipment. Most of Victor's phosphate expansion during the past year has been out west.

Armour Fertilizer Works has spent an estimated \$1,500,000 to double the capacity of its triple superphosphate plant. It has been stated that this plant will consume around 250,000 tons of phosphate annually. Although Armour has not issued any statement on its plans to recover uranium, it has been reported that this company is interested in this recovery along

down time when shifting from one mine section to another.

It is reported that TVA is continuing to prospect for phosphate in this area, having started here in 1950.

American Agricultural Corp. started expanding its production facilities a little over a year ago with a construction program estimated at \$1,875,000. This, it is understood includes a new 5000 kw electric furnace and addition of a concentrating section to their South Pierce phosphate rock plant to raise the efficiency and recoveries. AAC also has purchased a new Kennedy-Van Saun grinding mill, a new type to the phosphate fields, for delivery in 1953.

American Cyanamid Co. has modernized its general service facilities by adding a new 7000 sq ft office. The company also received delivery on its third Bucyrus-Erie 650-B dragline, which gives this company about the most modern mining equipment in the field.

A new land reclamation project of 150 acres started two years ago is beginning to show promise. By laying slime and sand layers alternately they find that land can be recovered. Another year or more of study will be required.

Swift and Co. started construction on additional triple superphosphate plant capacity this year. By mid-1953, construction will be completed and an increased production of 50 percent will be realized. Expense for this addition has been estimated at about \$1,500,000.

Swift also constructed a new general services building during the year. This new air-conditioned building of over 8000 sq ft was completed in December for housing control laboratory and research laboratory facilities, integrating this with new general offices.

Davison Chemical Corp. started construction in September on a new triple super plant estimated to cost \$12,410,000. This new plant will use 350,000 tons of phosphate rock annually, producing 200,000 tons per year of triple superphosphate. It is rumored that Davison will produce uranium as a by-product from its operations, although no direct disclosures to this effect have been made.

A new 650-B dragline was purchased at a cost of about \$750,000 and placed in operation in September.

Coronet Phosphate Co. has installed new drying, grinding and shipping facilities costing about \$1,000,000 at the Tenoroc Mine. Located adjacent to the mine and beneficiating plant they give over-all economies of operation with minimized materials handling. An increased capacity of 500,000 tons per year may be expected.

Biggest news to the trade, however, was that Coronet has been acquired

(Continued on page 78)



Coronet's new traveling stacker at the Tenoroc mine

A number of new Raymond 72 in. supermills are being added, and drying capacity is being increased by about 35 percent. Production from their Homeland, Clear Springs, Phosmico mines is to be served by this new shipping center.

U. S. Phosphoric Products Division of the Tennessee Corp. at East Tampa is the largest producer of triple superphosphates in the United States. Two certificates of necessity were granted to U. S. Phosphoric for a total of \$1,671,440 to cover expansion of its present triple superphosphate production. Involved in this expansion program is a 500-ton acid plant. This indicates that a sizable tonnage production increase is involved which could almost double past tonnage rates.

About the middle of last year a representative of the AEC reported that

with the other large triple superphosphate producers in the field.

A certificate of necessity for \$5,608,000 was granted to Armour in November for construction of a new mine at the site of the old Morris mine, abandoned since the 20's. Construction, to begin early in 1953, will add up to 750,000 tons per year to the phosphate producing capacity of this area.

F. S. Royster Guano Co., although well known to the fertilizer trade, will be new to the Florida production scene. In December the government granted a certificate of necessity for \$3,031,000 to aid Royster in the construction of a new triple superphosphate plant.

Kibler-Camp Phosphate Enterprise, Inc. has just built a new \$125,000 primary washer which it plans to "leap frog" with its older unit to minimize



Well trained workmen are safe workmen

Mining Sets New Safety Records in 1952

Management, Workmen, Unions, Public and Private Agencies Share Honors and Responsibility for Further Improvement

By J. T. RYAN, JR.

Executive Vice-President
Mine Safety Appliances Co.

THE coal mining industry achieved an all-time safety record during 1952. The total number of fatalities and the fatal accident frequency rate were the lowest in the history of American coal mining.

Based upon preliminary data compiled by the Bureau of Mines, the record is expected to show that 535 fatalities occurred in all coal mining operations last year. This is 250 less than in 1951. The fatal frequency rate (number of deaths per million man-hours of exposure) was .83 during 1952 as compared with 1.06 the previous year.

While this record is laudatory, there is a sobering note in the tentative

figures for the 1952 non-fatal injury record of coal mining. It is estimated that the number of non-fatal injuries per million manhours worked last year in all coal mines was the highest since 1948. This increase in the number of non-fatal injuries means there is need for increased accident prevention activities of all types. The difference between a fatal and a non-fatal injury frequently is slight. The margin is narrow. Almost any accident is potentially a fatal accident and the increasing number of non-fatal injuries calls for even greater emphasis on safety work in the future.

At the same time, the all-time record low of fatalities during 1952 reflects

what has been achieved during the past few years by safety-conscious members of the mining industry. A miner today is far safer on his job than his father was.

Much of the credit for the improved safety record in mining is attributable to educational efforts of various industry associations, federal and state agencies and bureaus, unions and the mining companies. Hundreds of firms in the mining industry sponsor safety contests and give numerous awards for individual and departmental achievements.

Only two major coal mine disasters (in which five or more lives were lost) occurred during 1952. One of these was in a Pennsylvania anthracite mine where five men died by drowning; the other occurred in a Pennsylvania bituminous mine where six perished as the result of a methane explosion. During 1951, five major disasters—all caused by explosions of gas or dust—occurred in coal mines. The first of these, on January 18, 1951, broke a 25-month disaster-free period.

It is interesting to note that the bituminous section of the coal mining industry with the preponderance of coal mining employees, had the lowest fatal accident record in its history, but, tentatively, the highest non-fatal injury experience in the last five

years; whereas the anthracite mines appear to have a fatality record slightly higher in the past three years but a non-fatal injury record substantially lower than for the same three-year period.

On the basis of preliminary data it appears that the non-fatal injury frequency rate of metal mines will be slightly higher for 1952 than it was in 1951, but the fatal frequency rate is down.

Quarries experienced the best fatal frequency rate record during 1952, according to early estimates. The non-fatal injury frequency rate is slightly higher than in 1950 or 1951.

The National Coal Association's Safety Division Manager, Harry Gandy, Jr., reports that 1952 was marked by exceptionally effective safety programs, spearheaded by various State Departments of Mines and other agencies. In Kentucky alone, during the first 11 months of the year, fatalities were 32 less than in the same period of 1951. In fact, in the Big Sandy-Elkhorn District of Kentucky production per fatality was two million-plus tons during the first 11 months in contrast with a fatal accident for every 450,000 tons of production in 1938.

Insurance Premiums Reduced

In the two leading coal-producing states—Pennsylvania and West Virginia—improvement in mining safety was so great that each state reduced premiums coal companies pay into the Workmen's Compensation Funds. It was announced that effective January 1, 1953 in Pennsylvania, the reduced compensation rates will save coal producers some \$373,000 annually. The new rate for anthracite indicates an over-all reduction of 9.4 percent, while there is a drop of seven percent for bituminous mining. In West Virginia, the Workmen's Compensation Commissioner reduced the base premium rate of coal subscribers from \$4 to \$3.75 on each \$100 of payroll, and lowered the loading charge from 15 to 13 percent of the base rate. These reductions are estimated to effect a savings to the coal industry of \$455,000 annually.

Safety Education Stressed

An important phase of the over-all safety program in the mining industry is the training of miners and supervisory employees in first aid and accident prevention and the training of Mine Rescue Teams carried on by various organizations.

During 1952, the Bureau of Mines issued first-aid certificates to some 35,000 persons, bringing to 1,757,000 the total number of those who have received first-aid training since the program was established.

In last year's first-aid training ac-

tivities, emphasis was placed on the Holger Nielsen method of manual artificial respiration which has been recommended as being more effective than manual methods previously used. A motion picture describing this back pressure-arm lift method has been produced by the Bureau of Mines, and will be released this year.

Special courses in accident prevention were attended by more than 2500 coal mine supervisors, 800 metal mine supervisors and 25,000 coal miners during 1952. These courses are designed to explore all the physical hazards of mining and measures to protect against them.

This year will mark resumption of the National First-Aid and Mine Rescue Contest which has done much

to stimulate interest in safety activities of the nation's mining industry. Location of the 1953 contest has not yet been announced but the date has been set for the last week of September, 1953. It is estimated that at least 50 First Aid Teams and 15 to 20 Rescue Teams will participate in the contest.

Another safety movement that sparks interest in accident prevention is the Joseph A. Holmes Safety Association. During 1952, the association awarded 406 certificates of honor to 249 companies and 157 individuals for their safety achievements. In addition, eight medals and certificates were awarded to individuals for saving lives at the risk of their own. Several new chapters of the associa-

INJURY FREQUENCY RATES ¹

Mines and Quarries—1948 to 1952 ²

Year	Coal Mining		Metal Mining		Quarries	
	Fatal	Nonfatal	Fatal	Nonfatal	Fatal	Nonfatal
1952	0.83	57.14	0.55	43.01	0.27	25.32
1951	1.06	50.70	0.59	42.84	0.29	25.21
1950	0.90	51.94	0.57	44.74	0.28	25.12
1949	0.91	55.11	0.48	48.07	0.36	26.48
1948	1.11	59.53	0.64	47.25	0.42	27.88

¹ Per million manhours of exposure.

² 1951-52—Preliminary Data.

INJURY FREQUENCY RATES—COAL MINING—1948-52 ¹

Bituminous Coal	No. of Injuries		Frequency	
	Fatal	Nonfatal	Fatal	Nonfatal
1952	434	30,500	0.80	56.37
1951	685	30,525	1.08	48.04
1950	550	28,380	0.93	47.83
1949	494	27,548	0.93	51.67
1948	862	42,078	1.15	56.28
Anthracite				
1952	101	6,300	0.98	60.92
1951	100	7,115	0.94	66.55
1950	92	8,855	0.75	71.72
1949	91	7,857	0.83	71.88
1948	137	11,304	0.91	75.69
All Coal				
1952	535	36,800	0.83	57.14
1951	785	37,640	1.06	50.70
1950	642	37,235	0.90	51.94
1949	585	35,405	0.91	55.11
1948	999	53,472	1.11	59.53

¹ 1951-52—Preliminary Data.

² Per million manhours of exposure.

CERTIFICATES OF HONOR AWARDED IN 1952 BY THE JOSEPH A. HOLMES SAFETY ASSOCIATION

Kind of Company	Number of Awards
Coal Mining	98
Metal mining	77
Petroleum	53
Quarries	11
Nonmetallic mining	6
Miscellaneous	4
Total, companies	249
Individuals*	157
Grand Total	406

*Note—In addition eight (8) medals and certificates were awarded to individuals for saving lives at risk of their own lives.

tion were organized last year, particularly in West Virginia where 4000 new members were reported.

Roof Fall Deaths Fewer

Roof bolting has been one of the most phenomenal developments in modern safe mining practice. During the last few years it has grown from a few pioneer installations in metal mines to an accepted method of support in more than 700 coal and non-coal mines throughout the United States. The manufacture of roof bolts has become "big business" as indicated by the fact that more than two million bolts are now being made each month.

This development undoubtedly is a major influence affecting the downward trend of roof-fall fatalities in coal mines. According to Bureau of Mines statistics, the coal mining industry suffered 1.21 fatal accidents per million tons of deep-mined coal during the five years immediately prior to 1948. Since 1948, this figure has been reduced to .79, and the rate for 1952 is estimated to be .70 fatality per million tons of deep-mined coal.

Mr. Joseph Bierer, Acting Chief of the West Virginia Department of Mines, reported that by the end of 1952 there were 220 mines in that state using roof bolts as a systematic means of support.

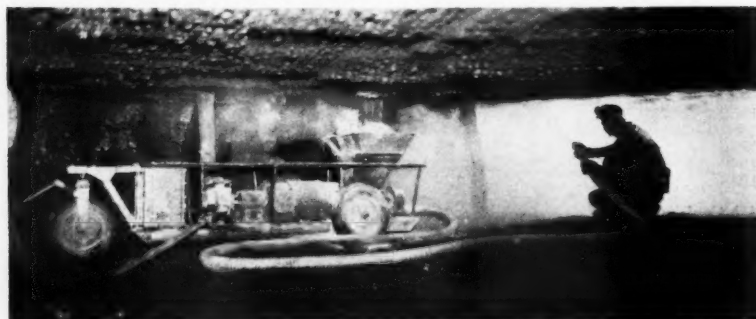
"By computation," Mr. Bierer stated, "the average rate of coal production per fatality for the seven-year period preceding 1949 was 995,807. For 1951, the rate was 1,914,576. This



Considerable progress was made in developing systems to catch rock drill dust

United States, notably in iron ore mining in Alabama; Lake Superior; Butte, Montana, and the Coeur d'Alene districts—also, the non-metallic mines of New Mexico, New York and Wyoming. Rock bolting now is being used systematically for support in tunnel driving and for underground storage excavations.

In connection with roof bolting oper-



Rock dusting prevents propagation of coal dust explosions

is an improvement of 92.3 percent in three years of bolting. Furthermore, if the previous average rate had continued, there would have been 152 fatalities in 1951 instead of only 79. In three years of bolting, by similar estimate, 137 miners have been saved from deaths resulting from falls of roof."

Rock bolts in metal mines, where their systematic use was originated in connection with mechanical mining, is progressing more slowly because the method is not so broadly applicable as in coal mines. Nevertheless, much experimental work toward general use of rock bolts is being done in virtually all non-coal mining districts in the

ations, considerable work was undertaken last year on dust collection systems to safeguard drillers against silicosis and to improve working conditions and visibility in this operation.

One model of these new devices, which recently was given Bureau of Mines approval, is known as the "Bolt Hole Cleaner." It can be used for electric rotary drilling upward, upward through channel and diagonally upward. In pneumatic drilling, approval also was granted for its use in drilling vertically upward, upward through channel, diagonally upward and vertically downward.

In addition to the electrically-driven cleaner, which is a self-contained unit

with a one-horsepower explosion-tested motor and control, there also are other assemblies that enable users to select a source of power best suited to their own operations. One rotary roof-drill manufacturer has concluded arrangements to install dust-collecting units as standard equipment on all its roof-bolting drills.

Two-Way Phones Aid Safety

Increased interest was evidenced last year in another development that has been designed not only for greater mine safety but for production efficiency as well. This is a two-way communications system for mines, based on the principles of electronics and patterned after that used successfully by the railroads. With this two-way voice communications system, dispatcher's orders are sent instantly and simultaneously to all motormen. The latter, in turn, can reply or communicate with each other while trips are in motion. In this system, each unit has a small loud speaker and a transmitting microphone.

A modified version of the system has just been developed for hoists. It permits instant communication between the hoisting engineer and the cage for load leveling, construction repairs, shaft inspection or passenger transportation instructions. The voice signals are picked up inductively at any point in the shaft and all chances of error and confusion attendant to the signal bell system are eliminated.

In connection with the development or improvement of protective equipment for miners last year, the Bureau of Mines issued an up-to-date summary of all approved breathing apparatus. This includes self-contained breathing apparatus; supplied-air respirators; dust, fume and mist respirators; and chemical cartridge gas respirators.

An improved model of the familiar Self-Rescuer has now been made available for mines. It protects the wearer for at least 30 minutes against deadly carbon monoxide which results from fires or explosions. The new unit has a replaceable chemical cartridge, making it economical to use for training purposes. Although compact enough to be carried individually by miners, the Self-Rescuers are being stored by several mines in quantity in metal "cache assemblies" placed at strategic locations for quick access in emergencies. In a metal mine recently, a number of men were caught in by a fire and all of them used Self-Rescuers to escape to a fresh air base.

The mining industry can be proud of its safety achievements in 1952. But there is a definite responsibility for management, individual workmen, unions and private and government agencies to continue the programs of education and cooperation which have, in the last half century, resulted in a steadily decreasing accident rate.



Mineral Dressing

Ball mill and classifier section of the Hayden concentrator

Progress In Ore Treatment Notable For Lively Research Programs, Increased Equipment Size, New Plants And New Uses For Old Methods

By **NATHANIEL ARBITER**

Associate Professor of Mineral Engineering
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MINERAL dressing in 1952 lacked 1951's dramatic reports of big tonnage concentrators in the making, but was featured by equally important developments. The use of larger equipment, particularly in crushing and grinding was a feature. Rod-milling for fine crushing was on the increase, with several announcements of dry circuits. Spirals and cyclones showed a steady increase in use with heavy density separation continuing to expand. Electrostatic separation was reported in new applications. The field for all forms of concentration is growing rapidly, particularly in new metals and in nonmetallics. Plant expansion was mainly in minor metals and nonmetallics and for smaller tonnage operations. Expansion of research activities was notable. Finally, there was increasing recognition that mineral engineering has come of age and is a profession of critical importance.

Build New Plants

Construction was in progress during the year for the White Pine project, the new Bisbee operation of Phelps Dodge, Anaconda's Yerington

project and Reserve's Babbitt and Lakeside developments. The Babbitt unit will be in full operation this Spring. The expanded Anaconda mill received its first ore from the Greater Butte workings. The new Chuqui Sulphide plant started up during the year and poured its first copper in November. Nicaro Nickel resumed operation after plant improvements, while Calera produced its first cobalt metal at Salt Lake. Erie announced that its taconite project near Aurora, Minn., will require an investment of \$300,000,000. The Three Kids, Nevada, manganese ore will be milled by Manganese, Inc. at a rate of 1200 tpd. Financing of the San Manuel copper project at \$102,000,000 was announced.

Asarco will build a 7500-tpd mill for the Silver Bell property near Tucson. Duval Potash started up its flotation mill at Carlsbad. The first South African plant to recover uranium from gold tailings began operations on October 8. Defense Materials Procurement Administration reported that for the fiscal year ending June 30, 436 projects to increase metal and mineral production were approved. Of these, 96 were for iron ore, 53 for copper,

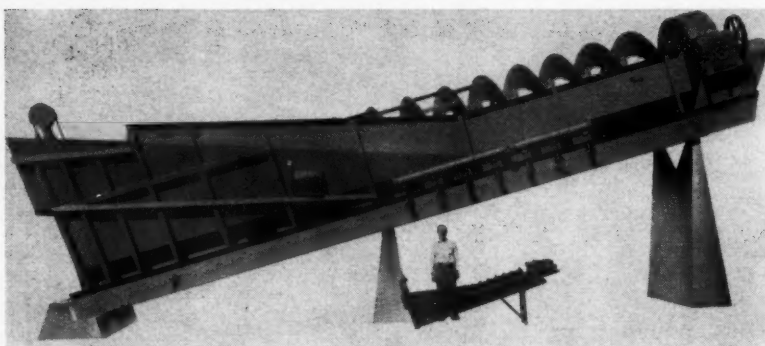
92 for lead and zinc, and 131 for non-metallics.

Big Crushers For Big Plants

World's largest gyratory, a 60-in., was made for Climax. Other new 60-in. machines are or will be running at Chuqui and Beaver Bay. A 66 by 84-in. deep-frame jaw crusher, also said to be the world's largest, is crushing almost 1000 tph at Detroit Dam, Ore.

Cone type crushers continue to dominate the secondary field, and rod mills are steadily becoming tertiary crushers ahead of ball mills. The latter trend is crystallized in the new Chuqui plant where $\frac{3}{4}$ to 1-in. cone product will be sent to rod mills. Other new rod mill installations are at Bullfinch, W. Australia; St. Helena, Orange Free State, and Geomines, Belgian Congo, where 9 by 11½-ft mills are used dry. A dry 9 by 12-ft mill is used for preparing a lead furnace feed elsewhere, and a wet mill of the same size for tertiary crushing of a lead ore. The 11½ by 12-ft mill at Sullivan has a capacity of 8000 tpd in crushing from 1½-in. to 90 percent minus six mesh. Rod consumption is 0.35 lb per ton.

Increasing size is evident in ball mills. Chuqui's 10 by 12-ft units will handle 2500 to 3000 tpd. These will be dwarfed, however, by the mills for the White Pine concentrator which will be 15 by 15-ft, with 1500 hp motors. To ship these monsters the manufacturer had to redesign the mill ends and bearings. Not to be outdone, two leading makers of spiral classifiers are providing larger machines with 84 in. the top size at this writing. Use of lump ore as grinding media is of continued interest; St. Helena finds that



(Photo courtesy Western Machinery Co.)

Twelve 84-in spiral classifiers will be used in closed circuit with six 13 by 13-ft ball mills at new northern Michigan copper mine

the rod mill-tube mill combination facilitates this practice.

Description and operating characteristics of the jet pulverizer for micron size continuous grinding were published. High cost and low capacity will limit this to special applications. An installation is working on Gouverneur, N. Y., talc. A vibrating ball mill is being developed and has graduated from the laboratory. Several asbestos plants are testing the Aerofall mill which appears to reduce the production of fine fibers.

Screening Advances

Electrically heated screens were first applied at M. A. Hanna's Crosby operation. The object is not to dry the ore but to prevent blinding, with

success more probable on finer screens. Equipment to convert existing screens is available. A V-screen was described as a rotated and gyrated vertical cylinder for wet or dry fine sizing. Centrifugal force is supposed to help.

The use of cyclones is growing so rapidly that it is no longer possible to keep track of installations. At least four manufacturers are in the field with both simple cones and impeller types. Hydraulic water is reported to give desliming efficiencies in the range 90-95 percent. The impeller feature is claimed to maintain constant water velocity and reduce pump power and maintenance. Among present applications are desliming of phosphate tailings, obtaining mine fill by dewatering mill tailings, desliming of zinc flota-

tion tailings, desliming and dewatering of pyrite concentrates, desliming of hematite flotation feed, and classifying in a lead middling regrind circuit. A vessel of new design was reported from London.

HMS Finds More Uses

At the coarse end heavy density separation continues to find new applications. One process alone has 160 installations going or in construction. The conical vessel is meeting competition from the spiral classifier and the single and double drums. Novel applications are in gravel treatment to make a sounder concrete aggregate, an underground installation in the Pyrenees and possibly for uranium recovery at Radium Hill, S. Australia. The new Tromp process using an unstable heavy medium was described.

Jigs and tables are by no means defunct. Columbite ore in Nigeria is preconcentrated with jigs, and air tables are used for concentrate cleaning. Jigs and tables are used also at Geomines to recover and separate tantalum and columbium. Tables are in use at the Sulphide Queen operation in California to scavenge rare earth tailings and to upgrade concentrates, and at Callinas, N. M., to separate rare earths from fluorspar.

New operations involving spirals described for the Kings Mountain, N. C., spodumene plant, where 0.2 percent heavy minerals are recovered and for the Starke, Fla., beach sand deposit where rutile, ilmenite and zircon are recovered. At the latter plant a 27 percent TiO_2 concentrate is obtained from a 1.3 percent feed in three stages of spirals. The TiO_2 tailings are feed for the zircon spiral plant. Other spiral installations are at Randville, Mich., in a hematite pilot plant to make a coarse finished concentrate in New Caledonia for chromite recovery, and for recovery of flake mica.

Both magnetic and electrostatic separation were in the news. One or both were in use for columbite, tantalite and monazite separations, for manganese concentrations at Phillipsburg, Mont., and for concentrating rutile, ilmenite and zircon, and for separating staurolite from ilmenite tailings.

A new super high intensity magnetic separator developed by Queneau of U. S. Steel will concentrate hematite and limonite. At the year-end, there was a beating of drums for a new dry process to concentrate potash and phosphate. It sounds like electrostatic separation after some preliminary magic not involving reagents.

Flotation in 1952 plodded along as the work horse for fine separations with no sign of exhausting its possibilities. The Three Kids, Nev., manganese ore will be floated and the uranium at Radium Hill, S. Australia, may be similarly treated. At least



Officials of Climax Molybdenum Co. inspect the world's largest gyratory crusher



Pipeline transportation received its share of attention

10 plants in Pennsylvania and Alabama are floating fine coal from river and dam bottoms and sludge. Reduction of coal ash to less than 1.5 percent is at the rate of 20,000 tons per year in England, with another 18,000 tons of capacity in construction. Use is for electrodes in aluminum recovery to replace imported coke. Wyoming Gulf Sulphur is treating 100 tons of brimstone ore per day to recover a 90 percent concentrate. Climax is making a 99.2 percent moly concentrate for lubricant by grinding regular production concentrate in porcelain lined mills and cleaning six times. Bagdad reported increased chalcocite recovery by use of a high lime circuit. Details of the Yellow Pine stibnite flowsheet were given as were the favorable effects of sulphur dioxide conditioning on Mt. Isa's lead, zinc and silver extractions. Germanium flotation from coal is a possibility.

Leaching Processes Spread

New applications for leaching continue. Most interesting was in recovery of uranium from Rand gold tailings. Dilute sulphuric acid, made by Fluosolids roasting of locally recovered pyrite, is used as solvent. Leach tailings are filtered twice with intermediate washing. Ion exchange is involved at some stage of the process. A total of 13 gold mills are presently scheduled to recover uranium from their tailings. Alkaline leaching of the Grants, N. M., uranium ore was indicated, and various leaching methods for tungsten were described.

A plant in Illinois is currently extracting uranium from phosphate with several more scheduled to start up soon. The U. S. Bureau of Mines described methods for recovering vanadium from phosphate.

Leaching of mixed sulphide-oxide ores of copper is on the increase. Anaconda's LPF process is operating. Cyprus Mines is leaching ahead of flotation but precipitating on scrap. The new N'chango flowsheet involves leaching after flotation with electrolytic copper recovery. Bagdad is con-

sidering roasting, leaching and electrolysis of sulphide concentrates instead of smelting.

Two processes for manganese beneficiation by leaching were described. One removes silica by caustic treatment, while the other dissolves manganese in ammonia-carbonate solutions. The latter method will be tried on the Cuyuna Range.

An improved method for magnetic roasting of lean iron ores involves a shaft furnace and a controlled CO/CO₂ atmosphere. Strength of magnetic pellets was studied as affected by temperature and time of heating, and by starch or sodium silicate binders. The treatment of taconites was reported to cut grinding costs in half but the heating cost was considerably higher than the indicated savings. A large proportion of new sulphuric acid production in this country and abroad is based on pyrite or pyrrhotite roasting.

Conveying Developments

Methods for design and control of acceleration in conveyor belts were described. Also published were operating data and costs on the three-mile Florida pipeline for phosphate pumping. Vitafors concentrator in

Sweden will receive ore from a five kilometer conveyor system. Pittsburgh Consolidated has a three-mile demonstration pipeline for pumping coal.

Linatex rubber is now available in this country. Liquid Neoprene can be applied by brush coating and curing to recondition pump runners and other wearing parts. Umfilira sprays a self-curing latex emulsion on chutes, dust fans, and air ducts for abrasion protection. Metal spraying was described for reconditioning and repair of worn parts.

Research Spurs Milling

Published research is a good index of the present health and future well-being of an industry. By all signs milling, in this respect, is coming out of the doldrums of the past years. Spurred on by the expanding role of concentration in providing for security in metals and minerals, research both by industry and the schools is laying the groundwork for the future. It is impossible in the space available to review progress in detail. The most notable event of the year was the Symposium on Mineral Dressing held in London by the British Institute. Forty papers were presented covering both practice and theory. Flotation received major emphasis, with grinding the runner-up. Sizing, gravity separation, cyaniding and electrical concentration followed in that order. Papers and discussion are to be published shortly.

Flotation also dominated the American journals with papers on surface chemistry and physics, and kinetics, while grinding theory continued to raise challenging problems.

The news sources for this review were principally the following journals: *Mining Journal* (London); *Mining Engineering*, *Engineering and Mining Journal*; *Mining World*; *MINING CONGRESS JOURNAL*; and *Chemical Engineering and Mining Review* (Australia).



Anaconda's LPF process is operating



First commercial source of aromatic coal hydrogenation chemicals—plant of Carbide & Carbon Chemicals Co., Institute, W. Va.

Coal Research

**Realization of Tremendous Potentialities Requires
More Research Plus Wide Application of New Methods
of Production, Transportation and Use**

By J. W. IGOE and H. J. ROSE

Technical Editor Vice-President and Director of Research
Bituminous Coal Research, Inc.

BCR surveyed 285 companies, associations, universities, or other institutions to discover as completely as possible the nature of coal research activities in the United States in 1952. Of these, 46 reported one or more projects related to coal. Some organizations known to be conducting research projects relating to coal or its utilization did not make information available for business reasons.

It appears that research on coal, its production, and use is being conducted by fewer groups than were active two years ago, when a similar survey was made. It also appears probable that the total annual investment in coal research by industry and government has remained relatively constant over the past few years.

This article summarizes the projects reported. They have been classified under the general headings of (1)

Properties, (2) Production and Preparation, (3) Utilization As A Fuel, and (4) Conversion. Projects are identified with the research group to give maximum value of the article to those readers who may wish more information.

Included under **Properties** of coal are any projects relating to coal structure, composition, and chemical and physical properties. **Production and Preparation** includes those projects having to do with coal resources, mining methods and equipment, mine drainage, transportation, and coal preparation research relating to sizing, cleaning, drying, and special treatment. Projects described under **Utilization As A Fuel** include all uses where coal is burned as such, handling at the point of use, by-products of combustion, coal-burning equipment, and related subjects. Projects under

Conversion of coal include carbonization, gasification, hydrogenation, and oxidation processes.

Properties of Coal

CONSTITUTION—The Coal Research Laboratory of Carnegie Institute of Technology continued its research into the nature of coal and coke, and published more than 20 papers during the year. It continued work on the identification of chemical products obtained from coal by various relatively mild reactions. This research emphasizes the aromatic structure and abundant presence of polymers of 6 and 5-membered rings in coal. Statistical studies were made of several thousand individual measurements by others of the reflectivity of coal, to see whether or not there is a step-wise variation in the reflectance of components, but the question has not yet been resolved.

The Coal Research Laboratory has also reported on coke reactivity, and has quantitatively measured the pore size distribution of coke in both the micro pore and macro pore ranges. Significant differences in both have been found for the cokes tested so far. Important conclusions were also reported on the surface area of crushed porous solids, fluid flow and mass transfer in packed columns, and coal sampling theory.

Among the many 1952 projects of the Illinois State Geological Survey, was an X-ray study which is essen-

tially completed, of rank increase in coals. This project studied the structural changes in vitrains and total coals which accompany an increase in rank from high-volatile bituminous coal to graphite. This group has prepared a manuscript on coal breakage, a result of their petrographic study of coal. Their petrographic and microchemical investigations of individual constituents of coal involve identification of botanical remains in coal by thin section and maceration techniques. They have completed another manuscript based on their study of natural coke resulting from intrusion of a coal bed by igneous rock.

Both the Illinois State Geological Survey and the University of Arkansas Institute of Science and Technology are using differential thermal analyses to study coal and allied materials. Both groups have issued publications on the results of their studies.

PLASTICITY—As a result of its studies on the expansion of coal, Eastern Gas and Fuel Associates reports success in applying a German laboratory-scale test which can be completed in three hours for the determination of the expansion property of coals. They feel that they can determine

Alabama coals has included a study of size and density fractions of some of the coals. To determine the fundamental composition of subbituminous coals, the Natural Resources Research Institute of the University of Wyoming is using the technique of isolating chlorinated compounds.

RARE ELEMENTS—Eagle-Picher Co. has analyzed hundreds of coals of many types from all over the United States to discover whether any of them carry germanium in amounts that are commercial. This metallic element, found in minute quantities in most coals, is valuable for widespread new applications in the manufacture of electronic devices. The U. S. Geological Survey has also been studying the occurrence of germanium and other rare elements in coal. The West Virginia Geological Survey has published a report on germanium in coals of that state.

The Lehigh Navigation Coal Co. is prospecting an occurrence of uranium ore on its property near Mauch Chunk, Pa. The Pennsylvania State College is developing techniques and standards for spectrophotographic analysis of anthracite ash to determine rapidly its major elements, and to discover traces of elements of special interest,

being investigated jointly by the Ohio Geological Survey and the Engineering Experiment Station of Ohio State University. The Illinois State Geological Survey has been investigating geographical factors which affect the quality of coal mine roof. The Virginia Polytechnic Institute has been making studies on roof and pillar action in mines and coal mine rock bursts.

ROOF BOLTING—The U. S. Bureau of Mines and the Engineering Experiment Station of West Virginia University have been making separate investigations on roof bolting. The West Virginia group has been studying stresses on roof bolts and the possibility of using wooden roof pins.

METHANE RECOVERY—Several groups, including West Virginia University and Christopher Coal Co. are studying means for de-gassing coal in advance of mining operations.

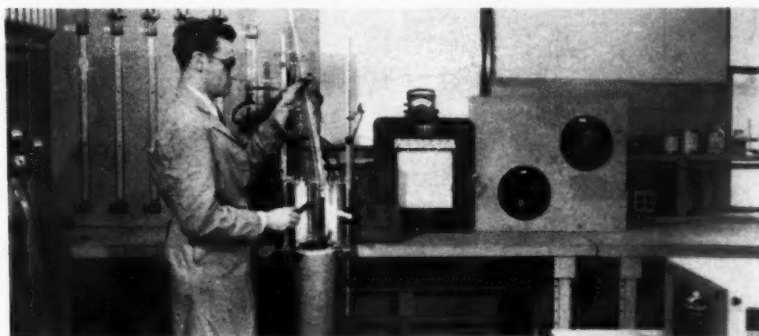
Systematic recovery of methane has been in progress in Germany since 1943. This methane removal had a marked beneficial effect on ventilation. Since World War II, this technique has spread rapidly to other European coal fields. Sixty-seven coal mines had or were preparing methane-drainage installations by the end of 1951. Methane is sold or used in about 50 percent of these, but safety underground is the primary reason for making the installations.

MINING—The U. S. Bureau of Mines in its anthracite mining investigations, has successfully applied block caving in steeply dipping beds and has perfected a method of retreat mining in pitching beds. They report that both have resulted in improved production and greater safety.

The Bureau in cooperation with Eastern Gas and Fuel Associates has experimented with modified longwall mining with a German coal planer. This experiment has resulted in improved production per man and effective control of the roof over a longwall face with yielding steel props and wood cribs.

The Atlas Powder Co., using an Army aerial camera which takes three pictures per second, has been helping coal strippers improve the efficiency of their blasting methods.

One of the most interesting developments in coal production is the continuous coal mining system developed by Carbide and Carbon Chemicals Co., designed primarily for mining coal in out-crop seams. The heart of this system is a mining machine launched from a self-propelled mining rig. The mining machine is unique because it does not require an operator underground. Four rotating cutting heads are used. Electric sensing devices on the outermost cutting teeth of the two outboard cutting heads indicate on a circular screen in the mining rig outside the mine. The operator,



Reactions of coke and oxygen were studied at Coal Research Laboratory, Carnegie Institute of Technology

whether a coal is safe, suspicious, or dangerous to use in coke ovens, and that they can predict pressures which will be developed in the coke oven without using conventional methods which require costly apparatus and considerable time to establish coal's expansion properties.

This company has been developing a method using the Gieseler Plastometer to test the plasticity of coal and is checking the method at several locations. The Illinois State Geological Survey has also been active in correlating and interpreting plasticity data obtained by Gieseler plastometers on Illinois coals. They are also working to improve methods for making ultimate analyses.

OXIDATION—The Alabama State Mine Experiment Station has been studying the rates of oxidation of coal by nitric acid. Their research on

such as germanium, vanadium, etc. Penn State has also been investigating the thermal de-ashing and graphitization of anthracite to determine the effect of temperature, heating rate, and soaking time on (a) the nature of ash constituents released and (b) the change in crystallographic structure of anthracite.

Production and Preparation

The U. S. Geological Survey, the U. S. Bureau of Mines and various state geological survey groups have continued their studies of coal reserves and other geological problems. The Ohio Division of Geological Survey during 1952 initiated a bed-by-bed study of Ohio coals. The first report, on the Meigs Creek bed, has been completed and is scheduled for publication early in 1953. This report contains details of coal cleaning studies

watching the screen, guides the machine up or down to follow the coal seam. Thirty-foot portable conveyors are added behind the machine as it cuts its way into the seam. This machine has bored 3 by 10-ft holes more than 700 ft into the seam. This depth was limited by the number of portable conveyors available at the time. With a recovery of about 65 percent, the machine has mined 1200 tons in a 24-hr day, and 6000 tons in a continuous week.

The experimental continuous mining machine of Bituminous Coal Research, Inc., developed under the direction of the BCR Mining Development Committee, was purchased for commercial development by the LeROI Co. of Cleveland, Ohio, and this work is going forward. Rights to a related BCR development of an extensible face conveyor were sold in 1951 to the Joy Manufacturing Co.

Interest has continued in the mining of outcrop coal by augers. The Department of Mining and Metallurgical Engineering at the University of Kentucky announced during 1952 the completion of their design for a coal auger.

As part of its health and safety program, the Bureau of Mines conducted research on exhaust gases from Diesel engines used underground, collected and analyzed the air-borne dust produced by various mining operations, tested mine atmosphere for toxic gases, and studied the fundamental problems relating to coal dust problems.

PREPARATION—Coal preparation research of the U. S. Bureau of Mines was concentrated on supplementing investigation on coking coal reserves to supply data on washing and carbonizing characteristics of coal where mining studies had shown substantial reserves. This research has indicated which coals can be used for metallurgical purposes without washing, which need washing by conventional equipment, those which require special treatment, and those which cannot be brought up to metallurgical standards by conventional methods. Bureau studies on cleaning and de-watering fine sizes of coal included investigation of ways to improve the capacity of flotation cells, studies of launder screens for cleaning anthracite, and the use of heavy media for cleaning western coals.

COAL FINES—Heyl & Patterson, Inc., has announced a new thermal drier for small coal. This company has continued research and development projects primarily concerned with the treatment and handling of fine coal, treatment of coal slurry, classification and desliming of fine coal, and factors influencing the moisture of fine size products.

Coal fines have been given additional attention by the Pennsylvania

State College through investigations on de-watering. Penn State has been investigating, also, the nature of the coal-water bond and the factors that influence the strength of frozen coal. They have been attempting to develop standard procedures for measuring this strength of frozen coal as well as developing the theoretical relationship between moisture content, coal size, and the strength of frozen coal. During 1952, they examined materials such as oils and salts which might decrease the strength of frozen coal by reducing the coal-water bond strength or by lowering the freezing temperature of the water.

MINE DRAINAGE—Research on the formation of mine-water acidity continued active. The Sanitary Water Board of the Department of Health, Commonwealth of Pennsylvania, and



Coal planer tested at Eastern Gas & Fuel Associates Stotesbury No. 11 mine

several coal groups have co-sponsored the continuation of mine drainage research at Mellon Institute. Bituminous Coal Research, Inc., continued its sponsorship of research on the same subject at West Virginia University.

The Western Pennsylvania Coal Operators Association, the Central Pennsylvania Coal Producers Association, and the Commonwealth of Pennsylvania co-sponsored engineering studies at Mellon Institute on the prevention and control of gob pile fires.

PIPE LINES—Two programs on the transportation of coal in pipes continued during 1952. The Pittsburgh Consolidation Coal Co. continued its research on pipe line transportation of coal in water. West Virginia University and the U. S. Bureau of Mines are cooperatively conducting several projects on the fluidization of coal for transportation through pipes, with emphasis on heat transfer to and from the fluidized coal.

Utilization As A Fuel

POWER—The great increase in recent years in the tonnage of coal used by electric utilities is stimulating re-

search and development work on the most effective use of coal for this purpose. The production of electricity from fuels is now four times as great as it was 15 years ago, and it is expected that by 1975 the total consumption of fuels for this purpose will be three times as great as at present. There is keen interest and speculation on the future possibilities of industrial power from atomic energy. The production of atomic products for military purposes requires very large amounts of coal, in fact when the Atomic Energy Commission completes its present expansion program, their facilities will require the electricity produced from 22,500,000 tons of coal annually, or about eight times the amount of coal now used for that purpose. However, if current research on breeder reactors is successful this

will change the situation as regards energy input and output from atomic sources. A number of the largest electric utility companies and suppliers are cooperatively studying possibilities of atomic power with the Atomic Energy Commission. Those who are well informed agree that coal can best protect its future in the huge power market through major programs of research and development in coal mining and utilization.

Recent developments by power-plant builders are exemplified in the many utility steam plants—totalling over 25,000,000 kw capacity—which are currently under construction. This enormous growth (45 percent of existing capacity) facilitates the rapid adoption of engineering developments. Fundamental research is needed to supply the basis for new engineering achievements in this field.

The Federal Reclamation Bureau on December 30, 1951, made public the results of a study of future power needs and sources in the West. Adoption of the proposals would have great effect on coal mining west of the Mississippi River. This economic study visualizes the integration of

hydro-electric plants which already exist, with new power-generating plants using coal. The power would be transmitted at about 500,000 v. over distances of 400 to 660 miles. The steam generating plants visualized would have capacities up to 2,000,000 kw each, and would be located in major coal fields of the West. This proposed plan would supply the expected power needs of 22 states, amounting by 1975 to more than the present requirement of the entire United States.

Coal Research Laboratory of Carnegie Tech continued its fundamental study of the stability of small pulverized-coal flames and the study of changes in the coal in the pre-ignition zone at the head of the flame.

Virginia Polytechnic Institute, during 1952, conducted two economic studies on power generation with coal as the fuel. They have been studying

minous coal industry, has continued experimental work on the development of a small automatic coal-fired steam generator at Battelle Memorial Institute. BCR is investigating well-engineered spreader stoker installations to determine the factors that have permitted these plants to operate with low dust and smoke emission. The objective of this project is to help engineer future spreader-stoker installations so they will operate within municipal ordinances. Several BCR publications were issued on the control of stack dust.

Central Pennsylvania Coal Producers' Association has sponsored studies on combustion and commercial single retort underfeed stokers. Penn State continued combustion research with an investigation of combustion through ash barriers using the Grendon technique.



Blasting research helped improve strip mining methods

the economics of a 2000 kw turbo-generator unit, and a high pressure boiler and turbo-generator unit for a central heating and power plant.

Several research groups have been working on subjects relating to industrial stokers. Westinghouse Electric Corp. has been developing an automatic cyclic purging cinder-reclaiming system, and has been working on the development of low-cost spreader stokers. The U. S. Bureau of Mines combustion investigations during 1952 included studies of heat distribution and flow of gases in a large spreader-stoker boiler, and methods of burning waste materials to avoid atmospheric pollution.

Hoffman Combustion Engineering Co. has been seeking to improve fly ash reinjection, reduce stack dust emission from spreader stokers, and has been investigating the effect of overfire air location on fluctuating load.

Bituminous Coal Research, Inc., the national research agency of the bitu-

SMALL EQUIPMENT—Late in 1952, the Board of Directors of Bituminous Coal Research, Inc., authorized setting up laboratory facilities to intensify BCR's utilization research in the residential and small commercial equipment field.

As a result of small-equipment research, BCR developed a coal-fired crop dryer for drying corn, hay, and small grains. This unit was extensively field-tested at agricultural experiment stations and on farms last summer. It is expected to be commercialized in the near future. BCR and the Agricultural Experiment Station of the University of Delaware have recently initiated a research project to develop an improved coal-fired heating system for chicken brooder houses. A completely new furnace-stoker installation for curing tobacco has been developed under a cooperative program by BCR, Norfolk and Western Railway Co., and the Stoker Institute of Canada.

Development work continued under

the sponsorship of Bituminous Coal Research, Inc. and the Stoker Manufacturers Association of a standard procedure for testing and evaluating bituminous stoker coals. Laboratories of Eastern Gas and Fuel Associates, Illinois Geological Survey and Battelle participated in the extensive test work required. As a result of these tests a revised tentative standard was issued in 1952.

The Illinois Geological Survey's comprehensive study of coal characteristics in relation to their performance in domestic stokers is being extended to include the effect of a freezeproofing agent, storage and heat drying of coal.

HEAT PUMPS—A number of organizations continued in 1952 to investigate heat pumps for residential and commercial heating and cooling.

IRON AND STEEL PRODUCTION—During 1952 BCR continued a cooperative project at Battelle with a group of electric utilities to ascertain the economics of producing common steels by electric furnaces instead of by the open hearth method.

The Coal Research Laboratory of Carnegie Tech during the past year made an analysis, on theoretical grounds, of data obtained from blast furnace operations and of laws of gas flow in packed columns. This analysis suggests the possibility of greatly increasing the productive capacity of existing blast furnaces by control of void volume.

The Mines Experiment Station at the University of Minnesota is studying burning conditions for fine anthracite mixed with fine iron ore concentrate as one phase of their methods for agglomerating iron ore.

LOCOMOTIVE AND MARINE—BCR conducted research on four motive power projects during 1952. The locomotive-size coal-fired gas turbine was operated for 756 hr on coal with an average load of 2760 hp, and an average coal rate of 2840 lb per hr. This project is being carried on under the supervision of the BCR Locomotive Development Committee. BCR continued its cooperation with several railroads in developing locomotive cinder-collection and cinder-burning methods for conventional steam locomotives. Because of the changing economic picture, segments of the railroads, electric utilities, electric manufacturing, and coal-producing industries joined forces to determine the possibilities of expanding railroad electrification in the United States. The objective of this project was to investigate the possibilities of overcoming, through technical and other improvements, the economic obstacles to railroad electrification. A report has been published on the results of this investigation. As a result of a cooperative research project by the coal industry through BCR with the Lake Carriers Association and the

Dominion Marine Association of Canada, it is expected that coal-burning lake vessels will be able to operate with lower stack emission in 1953 than in former years.

The Norfolk and Western Railway Co. is continuing its research leading to the most efficient utilization of coal in modern steam locomotives. The N. & W. will put into service during 1953 the most modern coal-burning locomotive of recent years. This unit is a 4500 hp coal-fired steam turbine electric locomotive now under construction by the Baldwin-Lima-Hamilton Corp. It will be roughly equivalent to a three-unit road freight diesel locomotive.

AGGREGATES—Three organizations are studying ways of producing lightweight aggregate using coal or mine wastes. Sinclair Coal Co. and Associates have built a pilot plant for the continuous processing of lightweight aggregates from coal mine wastes. Midwest Research Institute is investigating the selection of the best type of coal, the proportion of coal to clay, sizing of coal-clay mix and draft conditions. Midwest reports marked improvements have already been effected, and the project will continue. The Engineering Experiment Station of Iowa State College is investigating the suitability of shales from Iowa coal mining operations for the preparation of highway materials.

Conversion of Coal

CARBONIZATION—A number of research groups continued their study of coal carbonization. Illinois State Geological Survey carried out pilot plant experiments on the use of Illi-

nois coals in blends for making metallurgical coke. They have also been producing partially de-volatilized high-volatile coal as a substitute for low-volatile coal. They report that satisfactory metallurgical coke has been produced and volatile matter of char does not appear to be critical in the range of 16 to 20 percent. The U. S. Bureau of Mines has continued to report systematic investigations of the carbonizing properties and yields of American coals. U. S. Steel Corp. is engaged in 11 projects related to the study and evaluation of coals for use in the production of metallurgical coke.

Eastern Gas and Fuel Associates conducted several research projects on carbonizing coal with efficient production of coke, gas, and coal chemicals. Case Institute of Technology made studies on pitch fractionation, distillation products of Columbian coal, and extraction of tar acids with superheated water. Vacuum distillations were made by the Coal Research Laboratory of Carnegie Institute of Technology on high-volatile and low-volatile bituminous coal and subbituminous coal.

Mellon's Institute's annual report summarizes research projects relating to coal for several sponsors. Recent and present fellowships of Koppers Co., Inc., are mentioned such as: aromatic anhydrides, coke-plant physical technology, effluents treatment, gas purification, monomers, phenolic chemicals, polymers, tar constituents, tar distillation, tar products, tar synthetics, and special resins. Reference is also made to fellowships of the U. S. Steel Corp. on nitrogen compounds and nitrogen compounds technology. Philadelphia and Reading Coal and

Iron Co. during 1952 started a fellowship at Mellon Institute relating to anthracite broadly, including conversion to chemicals. Early in 1952 the new Koppers Research Center at Verona, Pa., near Pittsburgh, was occupied.

Pittsburgh Consolidation Coal Co., during 1952, put on stream a large low-temperature coal carbonization pilot plant that increases the value of coal. This plant produces a boiler-fuel char and at the same time gives high yields of coal chemicals. A complete refinery is being operated in conjunction with the carbonization pilot plant.

In the field of low temperature carbonization, the Department of Mining and Metallurgical Engineering at the University of Kentucky has continued its fundamental and engineering research, and Alabama Power Co. has sponsored low-temperature carbonization work at Southern Research Institute.

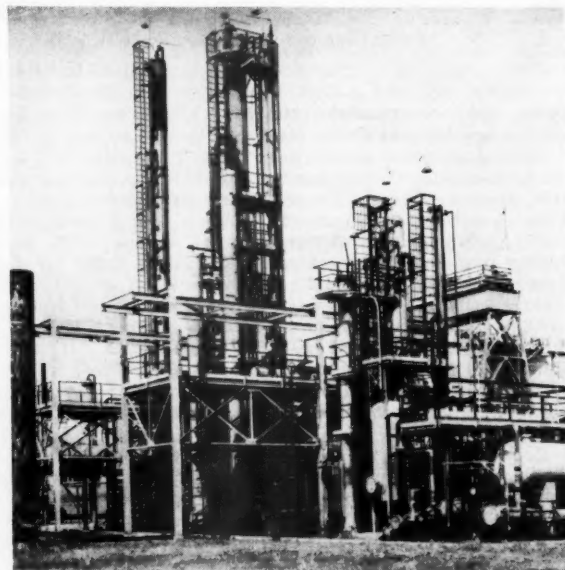
Montana State College has been designing a coking furnace and by-product equipment preparatory to experimental high-temperature coking of Rocky Mountain coals.

The Natural Resources Research Institute at the University of Wyoming has been studying the drying and carbonizing of subbituminous coals to determine limits in coal size and temperature limits obtainable in fluidized processes. Briquetting work at this Institute has sought to determine the suitability of other than asphalt binders.

The U. S. Bureau of Mines has developed, through pilot plant stages, a fluidized method of drying and carbonizing non-coking coal. A large



Coal fired crop drier was developed by BCR



USBM refinery at Louisiana, Mo., yielded 225,000 gal regular gasoline, 7000 gal aviation-base stock, and 400 gal jet fuel from coal



Locomotive-size, coal-fired gas turbine was operated 756 hours

commercial installation has been constructed and is being operated for the Aluminum Co. of America, by the Texas Power and Light Co. It uses Texas lignite as power plant fuel for an aluminum plant.

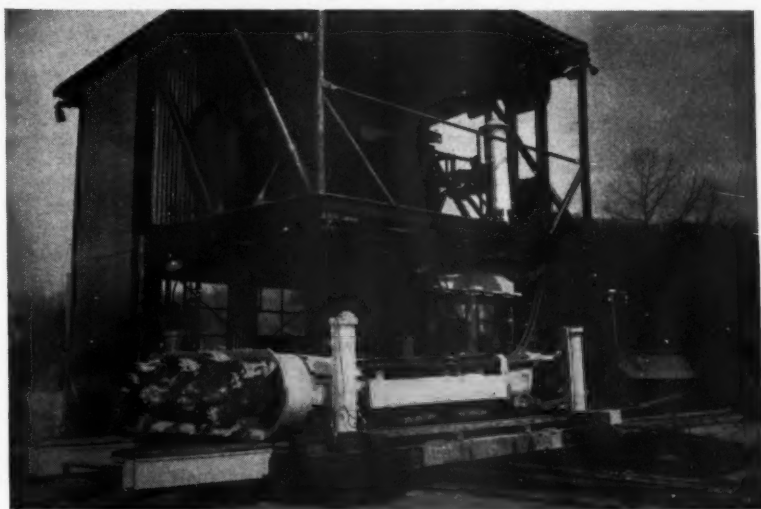
GASIFICATION—The American Gas Association has studied the fundamental reactions of carbon gasification under steady state conditions to get information about the factors which control the rates of these reactions. They seek information which would be broadly applicable for commercial processes to make water gas, producer gas, or synthesis gas for pipeline upgrading. The A. G. A. has studied the mechanism of the water gas reaction and pressure gasification of coal. The objective of the pressure gasification study is the development of a means for gasifying cheaper coals in powdered form as a start for synthesizing high Btu pipeline gas.

Progress has been made on a gas producer research project sponsored by BCR and a number of other sponsors at Battelle Memorial Institute. The objective is the development of a producer of high unit capacity which is compact, economical, and can gasify a range of coals.

The U. S. Bureau of Mines successfully operated a pressure gasifier at Morgantown, W. Va. The Bureau reports its development of an exceptionally sturdy and long-life Fischer-Tropsch catalyst and the development of a commercially feasible process for synthesizing alcohol from coal. The USBM, in cooperation with Anthracite Institute and the Pennsylvania State College has conducted producer gas tests for the gasification of bone coal. The Alabama Power Co., the USBM, and the Sinclair Coal Co. and Associates have extended their work on underground gasification of coal utilizing the electro-linking method developed by Sinclair Coal Co. and Associates. Synthesis gas was produced at the underground gasification in-

ergy than conventional electric generation methods.

HYDROGENATION—Carbide and Carbon Chemicals Co. is hydrogenating coal to obtain maximum yields of chemicals. A large pilot-plant, costing \$11,000,000 and located at Institute, W. Va., is producing chemicals from 300 tons or more of coal per day. A major reason for building this experimental plant was to determine what specific coal-hydrogenation chemicals can be produced economically. The objective is significant in that it is directed to the conversion of coal to chemicals rather than to motor fuel. The hydrogenation research of Carbide and Carbon Chemicals Co. and the carbonization research of Pittsburgh Consolidation Coal Co., although not slanted toward the future synthetic fuels market, are both developing processes and "know-how"



Continuous mining rig ready to advance into outcropping coal seam

stallation at Gorgas, Ala., by the use of pure oxygen.

Penn State has been making theoretical investigations on the mechanism and kinetics of gasification reactions. They have studied the carbon-carbon dioxide reaction, with specific reference to the influence of the form of the carbon and the changes in the physical form of carbon during reaction. The Coal Research Laboratory of Carnegie Institute of Technology has continued its studies on the kinetics of reaction in fluidized beds and has devised a method to estimate the activity of the surface carbon-oxygen complex by using radioactive carbon C^{14} as a tracer. Massachusetts Institute of Technology continued gasification studies.

Pittsburgh Consolidation Coal Co. has been granted patents on a fuel cell to produce electricity directly from gas made from coal. The combination process, if feasible, would recover considerably more of coal's inherent en-

which could be utilized in the production of such fuels.

The USBM coal hydrogenation demonstration plant at Louisiana, Mo., has made several runs using Pittsburgh seam coal, Wyoming subbituminous coal and North Dakota lignite to test their suitability for the production of motor fuels. The Bureau also completed studies on a small hydrogenation plant for producing chemicals and fuels, which would use 720 tons of coal per day.

The Coal Research Laboratory of Carnegie Institute of Technology continued its work and publications on the identification and properties of products obtainable by the mild hydrogenation of coal. As a part of this work, studies were made on the effect of pre-heated coal on yields of products. The Coal Research Laboratory has completed a comprehensive literature review on coal and tar hydrogenation. Virginia Polytechnic Institute has been conducting hydro-

generation studies on Midlothian coals at its Engineering Experiment Station.

Blaw-Knox Construction Co. has been exploring hydrogenation of coal to produce methane. They report that their study shows the over-all thermal efficiency of such a process compares favorably with other processes for converting coal. Their study also shows that 90 percent of the cost of producing high Btu pipeline gas lies in the production of purified synthesis gas. Efforts to reduce the cost of the process must be directed, therefore, to reducing the cost of the synthesis gas.

OXIDATION—The Coal Research Laboratory of Carnegie Tech continued their systematic investigation and publications on carboxylic acids and their esters obtainable by the oxidation of coal.

More Research Needed

The present amount of research on coal is relatively small in relation to coal's importance in the United States as a source of power, heat and chemical products. In 1952, plans for an enlarged and balanced program of research, engineering development, and technical promotion by Bituminous Coal Research, Inc. were endorsed by the coal and associated industries. Considerable progress was made in pledging support of producing companies at the rate of one percent per ton, but disturbed conditions in the coal industry have retarded signing up the minimum of 150,000,000 tons of annual production necessary to put the enlarged program into effect.

The report of the President's Materials Policy Commission published in five volumes in 1952, contained many estimates of trends and potentialities of coal and competitive products for the period 1950 to 1975. This report stated (Vol. I, p. 117):

"Though the promise is great for major improvement in use of the nation's rich coal reserves, three main steps must be taken to bring this about: (a) much greater effort to advance the technology of coal production, transportation, and use, (b) large-scale investment in widespread application of new methods, accompanied by a closer cooperation between the coal industry and major coal users, and (c) more stable management-labor relations to ensure continuity of supply to customers.

"Government can help on all three scores but the main burden of the job should be carried by private industry and labor.

"The Commission recommends:

"That the Federal Government, acting through the Bureau of Mines, undertake with the cooperation of private industry, labor, and private research organizations, a thorough appraisal of present research and development work relating to coal; and the

formulation of a strong program to advance coal technology to be carried out by a combination of private and public effort. In light of the needs revealed by this proposed study, ample funds should be provided by Congress to carry out the Government's share of a comprehensive coal research and development program, with provision for using such funds in part for contracting to non-Government research organizations.

"Beyond this, Government policies and programs which affect the coal and coal-using industries, directly or indirectly, should be reexamined to

Potash and Phosphate

(Continued from page 65)

by the Smith-Douglass Fertilizer Co. of Norfolk, Va.

Atomic Energy Commission opened an office at Plant City during August. Operations are under the direction of James J. Koenig, assisted by Frank E. McGinley. This new office, with its five-man crew would appear to give weight to statements being made by the commission and others as to their interest in uranium from the Florida phosphate area. The USGS also has an office here reportedly working with AEC.

Tennessee Report

In this state expenditures of a little over \$3,600,000 in new plant facilities in the area were reported during the year.

Shea Chemical Co. completed construction of a \$2,600,000 elemental phosphorus furnace and dicalcium phosphate manufacturing plant during the year. The furnace is a 25,000 kw unit, and was just ready for start-up at the year's end.

Rhum Phosphate and Chemical Co. bought the old Hoover and Mason drying and grinding plant at Mt. Pleasant and moved it to Columbia, at a reported cost of \$600,000. This modernized and relocated plant produces finely ground phosphate rock for direct application farm fertilizing.

Victor Chemical Works bought the old Hoover and Mason washing plant at Mt. Pleasant and has been using it on a one shift per day basis to supplement its phosphate furnace feed requirements. A reported \$300,000 has been spent on scrubbing equipment at Victor to reduce plant fumes.

International Minerals & Chemical Corp. purchased the Mt. Pleasant, Tennessee phosphate properties of Hoover and Mason.

Virginia-Carolina Chemical Corp. resumed mining of its Wales properties after more than 30 years. Railroad track facilities were installed and modern mining equipment was moved

insure that they are uniformly directed toward advancing coal technology, large scale investment in the application of such technology, and the broadening of markets for coal on a solid economic footing."

There were a total of 78 recommendations by the Commission, covering various resources and policies. From these the National Security Resources Board has selected 17 which they urge should receive special priority. The above-mentioned recommendation on the necessity for advancing coal technology, is one of these.

in. About 500 tpd production is expected for use as furnace feed to produce elemental phosphorus.

Western States Report

Phosphate chemical plant expansion is the most important new construction being reported in the West. Construction projects which were being completed during 1952 totaled about \$28,000,000, consisting of new elemental phosphorus production in the main.

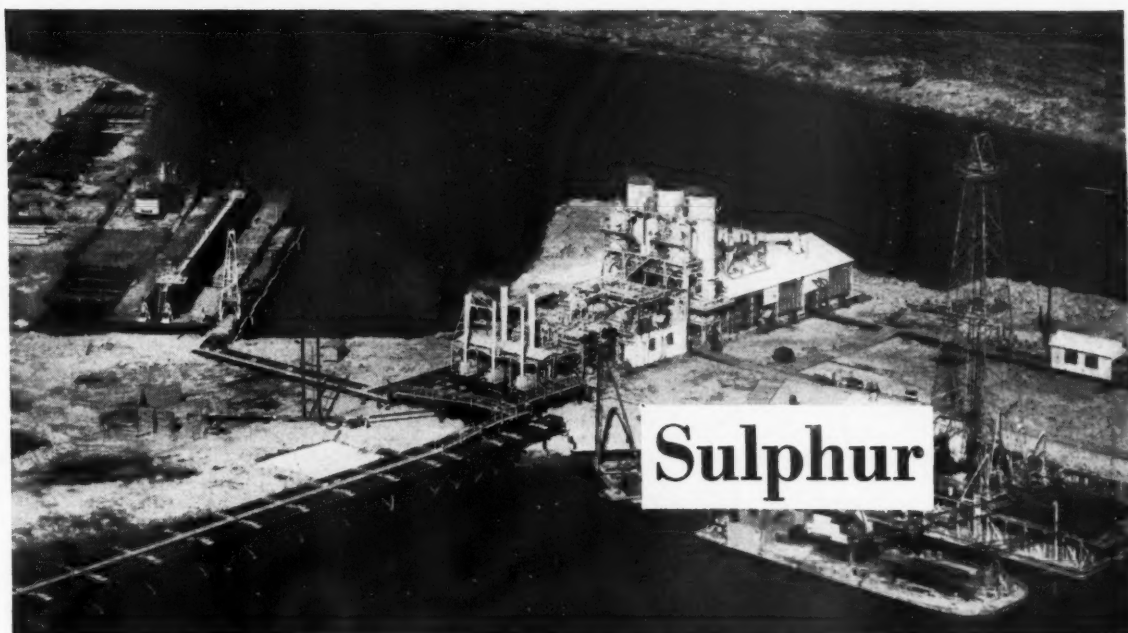
Victor Chemical Co.'s new Silver Bow, Mont., plant, estimated to cost \$12,000,000 has two new elemental phosphorus furnaces. These are rated at 28,000 kw and will produce about 14,000 tons of product per year. Victor's No. 1 furnace is now in operation, and the No. 2 furnace is expected to be running early next spring, when water-generated power becomes available.

Monsanto Chemical Co. at Soda Springs, Idaho, completed construction of a 40,000 kw furnace to produce around 25,000 tons of elemental phosphorus per year. This is reported to be the largest, single electric furnace built in the industry and although no cost figures have been released, it probably represents about \$10,000,000. This furnace is reported to have just started production.

Westvaco Chemical Co. at Pocatello, Idaho, started its fourth electric furnace for the production of elemental phosphorus in November. Largest of the four installed by this company, it probably represents a cost of about \$6,000,000 as part of Westvaco's total original \$20,000,000-program of construction at Pocatello. This new furnace is 27,000 kw and will probably produce about 15,000 tons per year of elemental phosphorus.

San Francisco Chemical Co. is in the western phosphate mining and beneficiation field. New grinding units are reported to have been added to their operation.

The author wishes to express appreciation to all those who contributed information used in this article.



"Floating" mine plant of Freeport Sulphur Co. on Bay Ste. Elaine, La., started production in November

An Outstanding Year Is Featured by New Production, Removal of Most Controls, Balancing of Supply and Demand

By JOHN C. CARRINGTON

Vice-President
Freeport Sulphur Co.

NINETEEN fifty-two was an outstanding year for the American sulphur industry. Production rose to a new record. The shortage which began after the outbreak of hostilities in Korea came to an end. And the outlook was brightened by many projects to increase the future supply of sulphur in various forms.

As the year began the shortage was still serious. Sulphur consumption had been placed previously under government control, and on January 1 the National Production Authority imposed more stringent restrictions. Domestic consumption in general was limited to 90 percent of the amount used in 1950. This curtailment made possible the granting of additional allowances for defense and essential civilian requirements without further reducing our depleted stockpiles.

At the start of 1952 sulphur was also under international allocation. The International Materials Conference from time to time set consumption quotas for some 30 countries, and as nearly all of these countries depended upon the United States for much of their supply, the Office of International Trade established export

allocations for them. Sulphur producers were directed to make shipments in accordance with the allocations.

With the passing months, the supply-demand situation improved. Some of the projects to increase the output of sulphur began to take effect. There also was some easing in demand due to the conservation of sulphur by consumers and also to the fact that inter-

mittently some consuming plants operated at less than full capacity.

By the middle of the year virtually all the domestic requirements for sulphur were being met, and there had been a great improvement elsewhere in the free world. In August NPA relaxed its restrictions on consumer inventories, and in November it removed all controls on domestic consumption and inventories. The supply of sulphur, the agency explained in announcing the action, had caught up with demand. The only controls remaining were those with respect to price and exports.

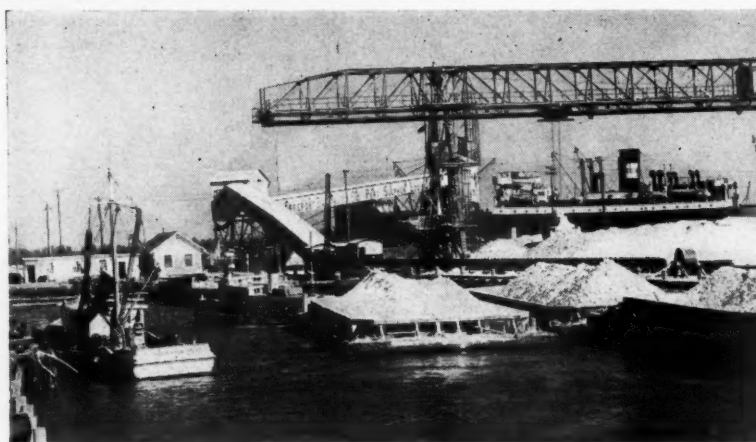
Half World Supply

For 1952 the U. S. supply of sulphur in all forms is estimated at 6,500,000 long tons. This represents somewhat over half of the free world total, which

TABLE I—U. S. SULPHUR SUPPLY

	1950 *	1951 *	1952 * Estimated
Brimstone:			
Fraser Process	5,192,000	5,278,000	5,300,000
Brimstone from gases, etc.	144,000	185,000	300,000
	5,336,000	5,463,000	5,600,000
Other sulphur:			
Sulphur in pyrites	393,000	433,000	450,000
Sulphur in gases	258,000	300,000	315,000
Sulphur in pyrites imports	100,000	107,000	135,000
	751,000	840,000	900,000
	6,087,000	6,303,000	6,500,000

* Supply figures in long tons.



Only controls remaining on sulphur were those with respect to price and export

is estimated at approximately 12,000,000 long tons.

Great bulk of the nation's supply was brimstone (sulphur in its "free" or elemental form), produced by the Frasch process from salt dome deposits along the Gulf Coast of Texas and Louisiana. Eight mines operated throughout the year, Boling and Moss Bluff of Texas Gulf Sulphur Co.; Grande Ecaille and Hoskins Mound of Freeport Sulphur Co.; Clemens, Long Point and Starks of Jefferson Lake

Sulphur Co.; and Orchard of Duval Sulphur & Potash Co.

In addition to these eight mines, two new mines were completed and put into operation during the year. The first to begin production was Spindletop, a name famous in the early history of oil. This dome was developed by Texas Gulf and put into production shortly before the middle of the year. The second was Bay Ste. Elaine of Freeport in the Louisiana coastal marshes, where a marine form

of mining is being employed. The mining plant and auxiliary facilities were built on barges, floated to the site, and sunk in place. Production began in November.

Sulphur was obtained also from sources other than salt dome deposits, as shown by Table I. Some of this was brimstone recovered from sour natural gas and petroleum refinery gases. The remainder was sulphur not produced in elemental form but contained in pyrites, smelter gases and other sources utilized for their sulphur content.

Recovery of brimstone from gases, while not large in relation to Frasch process operations, increased materially during the year. Table II, which lists sulphur projects completed in the free world in 1952, shows the new operations of this type. While individually the capacity of many of the projects may be small, taken as a whole they make up an important total. Some of them were not completed until late in the year, and therefore their full effect is not reflected in the 1952 supply figure.

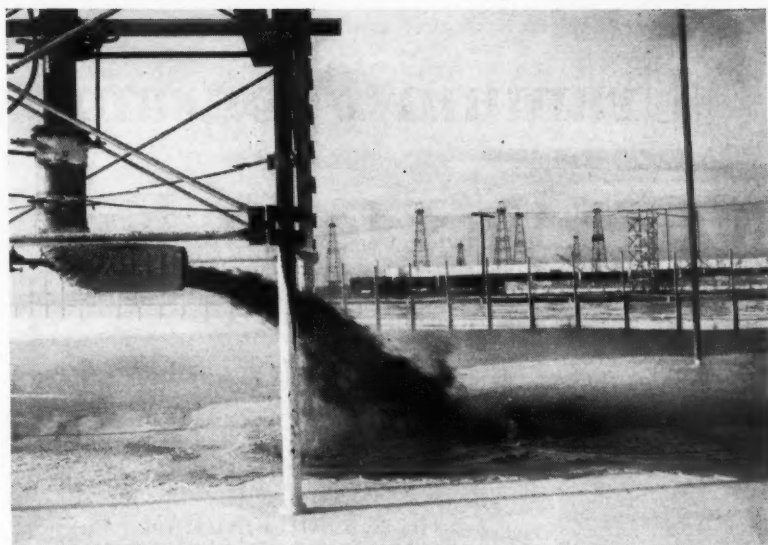
Stockpiles Grew Slightly

Against the U. S. supply of 6,500,000 long tons in 1952, consumption including exports is estimated by the government at 6,090,000 long tons. The difference between supply and con-

TABLE II—NEW SULPHUR PROJECTS COMPLETED IN 1952

Source	Company	Location	Production date	Estimated capacity (long tons S)
Brimstone:				
Frasch Process	Freeport Sulphur Co.	Bay Ste. Elaine, La.	November	100,000
	Texas Gulf Sulphur Co.	Spindletop, Tex.	June	400,000
Surface deposits	Chemical Corp. of America	Sulphurdale, Utah	First half of year	10,000
	Chemical Plants Corp.	Tixan, Ecuador	First half of year	10,000
Sour natural gas	Gulf Oil Co.	Waddell, Tex.	March	7,000
	Mathieson Chemical Co.	Stamps, Ark.	February	21,000*
	Odessa-Sid Richardson	Odessa, Tex.	January	7,000
	Petroleos Mexicanos	Poza Rica, Mex.	September	10,000*
	Phillips Chemical Co.	Crane, Tex.	August	17,500
	Phillips Chemical Co.	Goldsmith, Tex.	March	44,000
	Royalite Oil Co.	Turner Valley, Canada	June	10,000
	Shell Oil Co.	Jumping Pound, Canada	February	10,000
	Stanolind Oil & Gas Co.	Slaughter, Tex.	October	14,000
	Warren Petroleum Corp.	Monument, N. M.	July	5,200
Refinery gas	Consol. Chem. Ind., Inc.	Baton Rouge, La.	January	14,000
	Gulf Refining Co.	Port Arthur, Tex.	December	21,000
	Hancock Chemical Co.	Los Angeles, Calif.	January	17,500*
	J. L. Parker	Madill, Okla.	July	3,500
	Shell Chemical Co.	Houston, Tex.	October	13,000
	Shell Oil Co., Ltd.	Stanlow, England	March	10,000
	Sinclair Refining Co.	Marcus Hook, Pa.	October	7,000
	Standard Oil Co. (Ind.)	Whiting, Ind.	August	19,200
	Swedish Shale Oil Co.	Kvarntorp, Sweden	During year	14,000*
	Union Oil Co.	Wilmington, Calif.	November	17,500
Other sulphur:				
Pyrites	Normetal Mining Corp.	Dupuy, Quebec, Canada	Late in year	4,500
	Electro Kjemisk	Skorovass, Norway	November	75,000
Smelter gases	Aluminum Co. of Canada, Ltd.	Arvida, Quebec, Canada	July	18,900
	American Smelting & Ref.	San Luis Potosi, Mexico	During year	3,000
	Bleiberg Mining Union, Ltd.	Carynthia, Austria	Early in year	5,000
	Canadian Industries, Ltd.	Copper Cliff, Ont., Canada	October	40,000
TOTAL NEW CAPACITY				948,800

* Additional capacity added to an already existing plant.



Molten sulphur pours into giant vat. Stockpiles and inventories increased slightly in 1952

sumption is accounted for by increases in producers' stockpiles and in consumer inventories. Stockpiles, which had declined from a prewar peak of two years' supply to a low during the shortage of only six months, have been increasing slightly. As the government does not stockpile sulphur, these stocks are our only important safeguard against emergencies.

Export allocations during 1952 amounted to 1,275,000 long tons. The United Kingdom with 356,000 tons was granted the largest allotment, closely followed by Canada with 345,000 tons. Other recipients of substantial allotments were Australia, France, New Zealand, the Union of South Africa, Belgium, Brazil and India.

The remaining 4,815,000 tons represented estimated consumption by industry and agriculture in the United States. This figure does not include any reused sulphur, such as that in regenerated acid or spent acid. About four-fifths of the total sulphur consumed in this country was converted first into sulphuric acid, and the remaining one-fifth was used in elemental form or made into carbon bisulphide or other chemicals.

Outlook Encouraging

With the prospect of a supply of sulphur adequate to meet all the needs of industry and agriculture plus the export demand, outlook for 1953 is brighter. Government estimates place the anticipated U. S. supply at 7,000,000 long tons and the anticipated demand including exports at 6,637,000 tons. Moreover, a great many projects are under way to increase further the sulphur producing capacity of the United States as well as of other free world countries.

Much of this activity centers on the

development of new Frasch process deposits. Freeport is constructing a mining plant at Garden Island Bay dome at the mouth of the Mississippi River. This mine, which has as its objective the production of 500,000 tons of sulphur a year, is expected to be in operation around the end of 1953. Freeport also is developing a small deposit at Nash dome in Texas, having as a goal the production of 70,000 tons a year. Texas Gulf has undertaken a program of expansion at its Moss Bluff mine to increase capacity by 50 percent; and two new companies, Mexican Gulf Sulphur Co. and Pan-American Sulphur Co., have announced projects to develop deposits in Mexico.

While these Frasch process projects account for a large part of the expected new capacity, a substantial total of brimstone will be provided by projects to utilize other sources. In the United States additional plants are being built to recover sulphur from sour natural gas and from refinery gases, with most of them due to be completed by the end of 1953. In a number of other countries there are projects to increase the output from deposits of native sulphur and to develop new deposits of this type. Finally, a further amount of sulphur in forms other than brimstone is expected to be obtained as a result of projects to utilize pyrites, refinery gases, smelter gases and sulphate minerals in many parts of the world.

It is estimated that, all told, these projects by the end of 1955 will add 3,000,000 tons a year of sulphur producing capacity to the approximately 1,000,000 tons added in 1952. This total of 4,000,000 tons is equivalent to one-third of the prior capacity of the free world.

Thus the outlook for meeting future needs for sulphur is encouraging. If these projects materialize as anticipated and if production from existing sources is satisfactory, there should be ample sulphur for all requirements.

Sulphur, the element, occurs abundantly in nature. Nearly every nation has at least one or more forms of it. Numerous untapped sources exist that could be developed should this be necessary. In the years ahead, if the law of supply and demand is allowed to work normally, it should bring about whatever developments are required to insure that the needs of the world for this essential raw material are always met.



Prospect of adequate sulphur supply brightens outlook



Uranium Program Continues to Expand

At End of Tenth Year of Atomic Age,
America Still Leads the Way

By T. E. GILLINGHAM
U. S. Atomic Energy Commission

Slugs of uranium are loaded into huge atomic reactor to
make radioisotopes

*Prove true, imagination, O, prove true
—Twelfth Night*

THE first decade of the Atomic Age ended in 1952. It was a notable period in the world's history. Commencing with the first controlled release of atomic energy in Chicago in 1942, the decade's accomplishments in the field of applied nuclear physics, awesome as they are, bear witness that scientific hopes and imaginations are proving true.

Today, military needs of atomic energy are still paramount; security measures must still stand guard. But now, as military applications become more and more questions of detail, we see emerging from behind the veil of fear and fantasy a new and broader concept—the concept of atomic power for good instead of for destruction.

Already the awareness of this new potential is stirring the world's capitals and making itself felt in the councils of nations. For, if atomic power plants could be made to serve the world, it is conceivable that waste lands could be irrigated, backward lands developed, and great cities lighted and heated almost independently of the carbon fuels. If, as we hope, man designs not to blow himself to bits, his future on earth may be extended for many generations with the help of atomic power.

In atomic energy developments, America leads the way. The program is enormous. Congress appropriated for it, last year alone, over four billion dollars; by next July, the total national disbursements for the program since 1941 will total almost nine billion dollars. Thus, in just over a decade,

a new multi-billion dollar enterprise has come into being—an enterprise based on what was thought to be a very rare element—uranium. That this enterprise has reached the advanced stage of today is a great credit, not only to the physicists and engineers who solved the problem of controlling nuclear fission, but also to the prospectors, geologists, miners, and metallurgists who sought out and brought into production the new sources of uranium ore.

From Mine to Reactor

Just how does uranium ore fit into the atomic energy program? It is absolutely essential; it is not merely a flux or reagent; it is as fundamental as iron ore is to the steel industry. But, like iron, uranium must travel a complex path from ore in the mine to the ultimate forms for use.

Uranium ores are exceedingly variable in grade and in content of other elements. The ore may be any one of several types: a straight pitchblende ore, carrying as much as several percent uranium and very little else of value; a carnotite type, carrying from two to ten pounds of uranium and several pounds of vanadium per ton; or a complex ore, carrying several pounds of uranium and more or less gold, silver, lead, zinc, and copper. Uranium may be recovered as a by-product from other materials, hardly to be called ore, containing, perhaps, less than a half pound of uranium along with some other substance, such as phosphate or petroleum. Each of these types has its metallurgical and other limitations which determine what may be called the "economics" of the uranium mining industry.

Suitable domestic ores are sold by the miner, at scheduled prices, to a privately owned or privately operated ore buying station or ore treatment plant, where they are sampled for assay. In 1952 three new buying stations—Grants, N. M., Shiprock, N. M., and Edgemont, S. D.,—were opened for business. The capacities of several ore treatment plants were increased and the foundation of the new Anaconda plant at Grants was laid.

Ore May Go One of Two Roads

In the typical ore treatment plant, the ore is crushed, dried, and concentrated by hydrometallurgy in either an acid or an alkaline circuit, depending on the ore type. The concentrates are shipped to other plants for processing to a product of exceptional purity, which is converted in turn into uranium trioxide, uranium dioxide, and uranium tetrafluoride. At this point the path splits. If the material is to go eventually to the vast gaseous diffusion plants at Oak Ridge or Paducah, the tetrafluoride is converted into the hexafluoride, a corrosive gas. If the material is destined for the chain reactors at Hanford or Savannah River, the tetrafluoride is reduced to metallic uranium and fabricated into exact shapes for insertion into the giant reactor piles. The end products—uranium 235 from the first process, and plutonium from the second—are usable as weapon material or as fuel for nuclear reactors to power submarines and ships. In time these same materials may provide energy for industrial purposes.

This background of fact and, if you

will, of speculation, is necessary for a sympathetic understanding of the problems facing the men in charge of the vast program of the Atomic Energy Commission. Of more immediate concern to the mining industry is the question: How are the raw material needs for this expanding program being met?

The AEC Organization

The Director of AEC's Division of Raw Materials has the responsibility for finding, acquiring, and concentrating the needed uranium ore. He is empowered to negotiate with foreign producers and governments for the acquisition of ores and concentrates produced in foreign countries; he directs through his several sub-divisions the functions of exploration, procurement, and metallurgical research. It is the policy of the Commission to enlist the aid of private industry as much as possible in the performance of these functions. Private industry mines and, for the most part, concentrates all the uranium ore produced in this country; corporations, universities, and private individuals perform under Government contract much of the metallurgical and basic geological research. Only in the fields of geological reconnaissance, physical exploration, and ore reserve assessment does the Government perform much of the work itself, and even here the physical work, such as drilling, is done by private contractors.

In its exploration and research efforts the Commission has enlisted the services of other Government agencies. On behalf of the Commission, the U. S. Geological Survey maps and studies selected areas of the country, directs a large part of the physical explora-

tion on the Colorado Plateau and carries on much fundamental research. The U. S. Bureau of Mines drills for uranium and thorium and develops ways of recovering these materials from the ores. The AEC itself employs a large staff of geologists and engineers to do reconnaissance and mining geology, to plan and direct physical exploration, and to assist mine operators on problems of access roads, bonus payments and other incentives.

In 1952 AEC's Exploration Branch, which already had field offices in Denver, Grand Junction (Colo.), and Spokane, moved the Spokane office to Salt Lake City and established new sub-offices in Hot Springs, S. D., Butte, Mont., and Richfield, Utah. Additional field offices will be set up in 1953. In December, operational authority over exploration and procurement for the Colorado Plateau area was vested in a new Grand Junction Operations Office.

Develop Tools and Methods

All the older, and several new tools and techniques of mineral exploration are used to find uranium deposits. The well known Geiger counter and the more sensitive, but more expensive, scintillation equipment have been adapted to probes for drill hole logging. In 1952 isorad maps, showing "contours" of equal radioactivity determined from drill holes, were first used extensively to delineate Plateau-type orebodies.

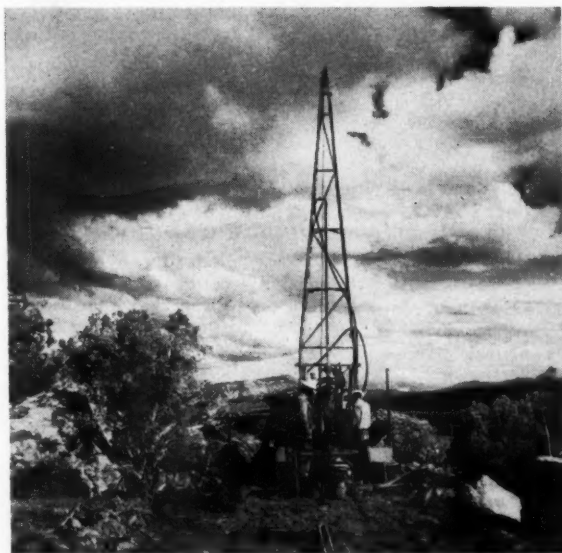
Airborne scintillation equipment has been improved. It is now being flown in DC-3 planes by the U.S.G.S. and in lighter planes by the AEC. The larger planes fly at an altitude of 500 ft for general coverage, and the

smaller planes fly at very low altitudes for detailed coverage. This cooperative system was first applied in 1952 in the Powder River Basin of Wyoming, where studies of airborne scintillation logs by the U.S.G.S. in 1951 had disclosed several radioactive anomalies. Ground investigations in 1952 showed these to be due to pockets of uranium ore in sedimentary formations.

In 1952, AEC low-level airborne radiometric surveys in the Black Hills area of South Dakota and Wyoming, in the San Rafael Swell area of Colorado, and on the east flank of the Big Horn Mountains, Wyo., disclosed numerous anomalies which are being investigated by follow-up ground crews. In May 1952 the Commission announced that locations of these anomalies would be posted periodically on index maps at various points in the West and in New York.

Several mining companies, including Anaconda and Homestake, have located new deposits by observing the needles of scintillometers carried in small planes over areas of the West.

Unfortunately gamma ray detectors will not detect uranium minerals under even a few inches of barren cover. Subsurface exploration methods are required to delineate covered orebodies. Surface resistivity measurements and geobotanical methods, both of which were applied in a preliminary way in 1952, may help to narrow the target, yet the main subsurface tool is the drill. In the five year period, 1948-1952, about 4,000,000 ft of diamond and wagon drill holes were put down by Government contracted and private drills in quest of uranium ore, mostly on the Colorado Plateau. For 1953 the Government alone plans more than 1,000,000



"Isorad" maps determined from drill holes were used to outline orebodies



Ore is stockpiled at buying depots, sampled for assay and sent to treatment plants



Uranium can be recovered as a by-product during processing of Florida phosphate

ft of hole. Drill hole patterns reflect careful preliminary geological studies, which aim to find the maximum tonnage of ore per foot of hole.

Foreign Sources of Ore

America imports more uranium ore and concentrates than she produces at home, though in 1952 she held second place in mine production. The Shinkolobwe mine in the Belgian Congo, after three decades of leadership, is still the greatest uranium mine in the world. Another veteran producer, the famed Eldorado mine at Great Bear Lake, Canada, in spite of a disastrous mill fire during the year, yielded in

eral years of research and development, carried out in secrecy by British, South African, and American metallurgists. Present plans call for by-product recovery of uranium from the residues of at least 12 other mines in the Witwatersrand and the adjacent Orange Free State. The new plants will cost over \$100,000,000 and will include separate facilities for the manufacture of sulphuric acid, which is needed in the uranium extraction process. Within a short time this program will make South Africa one of the world's largest producers of uranium.

Uraninite was first recognized in South Africa in 1923 by R. A. Cooper

marginal gold rock in certain reefs will be brought into ore reserves by virtue of the uranium content, thus extending the life of several mines thought to be almost exhausted.

Another new source of great potential is the Rum Jungle copper-uranium deposit in folded meta-sedimentary rocks about 60 miles southeast of Darwin, in the Northern Territory of Australia. In August 1952, the first shipment of ore was made from this property. In South Australia, the long-known deposit of the uranium mineral davidite at Radium Hill, 200 miles northeast of Adelaide, is being prepared vigorously for production. Geologists of our own AEC are co-operating with the Australians in exploring and developing both the Rum Jungle and the Radium Hill areas.

Noteworthy progress was made in 1952 by Eldorado Mining and Refining Ltd. in developing the Ace mine in the Beaverlodge Bay area of northern Saskatchewan. The initial Ace plant, scheduled for 1953 opening, will treat 500 tons of ore daily, making the Ace the leading uranium producer in the Western Hemisphere. Other promising Canadian deposits, particularly those in the Lake Athabasca country, are being explored and developed.

Elsewhere in foreign fields, exploration for uranium is well under way. The reviewer a year hence will be able to report interesting developments in Northern Rhodesia and, we hope, in a number of other countries.



Domestic production represents the combined yields of many small mines

1952 an important tonnage of ore and today has large known reserves. The mines in the Urgeirica district of Portugal turned out small, but significant, tonnages for the supply of the Free World.

But most exciting are the great new foreign sources that loom above the horizon and promise future production for many years.

South Africa now produces uranium concentrates from post-cyanidation slimes of the Rand gold mills. The first recovery plant, at West Rand Consolidated Mines, was opened by Prime Minister Malan in a notable ceremony on October 8, 1952. This opening was the culmination of sev-

who at that time was investigating the heavy minerals concentrated on the corduroy blankets in the gold mills. But not until 1944-45, when Drs. Weston Bourret and George Bain, representing the U. S. Government, and Dr. C. F. Davidson of the British Geological Survey reported on the uranium occurrences, were the potentialities of the reefs recognized. While the average content of uranium in a ton of Rand gold ore is not high, the aggregate content of the reefs is enormous. Fortunately, much of the reef material can be mined and milled profitably for gold alone, so that uranium will be a true by-product. On the other hand, large tonnages of sub-

Domestic Output Grew

Domestic production of uranium is increasing constantly. In contrast to foreign production, which comes from a small number of relatively large vein deposits of pitchblende-type ore, the domestic output represents, for the most part, the combined yields of several hundred small mines in the vast Colorado Plateau.

Within the Plateau many new ore-bodies were discovered in 1952 by Government and private exploration. Most of these new discoveries were within, or adjacent to, the known uranium districts—Uravan, Colo.; Moab,

(Continued on page 89)



Lower grade ore meant fewer pounds of copper refined from domestic mine output

Copper

World Supply and Demand Approach Balance as Year Ends But Ceilings On Prices Remain Fixed

By I. K. HEARN

Assistant to the President
Kennecott Copper Corp.

DEFENSE requirements coupled with a vigorous civilian economy continued to create in 1952, as they had in 1951, a heavy demand for copper. Current production was unable to equal the demand despite strenuous efforts by the entire copper industry.

Although production costs have been steadily increasing, the bulk of domestic copper was sold during 1952 at the same price as that which prevailed throughout 1951 and the latter part of 1950. However, starting in May 1952, there was a spread of 12 cents per lb between the controlled domestic price of 24½ cents and the delivered price of 36½ cents for Chilean copper.

The domestic price situation was complicated by the Government's permitting a few producers to sell their copper above the ceiling set by the Office of Price Stabilization for the major U. S. copper producers. These individual ceiling prices ranged to well over 30 cents per lb of copper. Fabricators could not pass on to consumers any of the costs of domestic

copper which exceeded the ceiling price of 24½ cents, but effective July 1, 1952, were permitted to pass on to the consumers 80 percent of the cost increment between 24½ cents and the higher price of the foreign copper used.

Domestic Output Lower

Despite the Government's efforts to stimulate an increase in the production of domestic copper by permitting

above ceiling prices to be charged by some of the high cost operators, the production of new copper refined from domestic ores is expected to show a decline from the 1951 level. New copper refined in this country from foreign origins will be about the same volume in 1952 as in 1951.

A probable decrease in copper refined from domestic ores may occur even though production losses due to work stoppages in 1952 were less than those experienced in 1951. Approximately 30,000 to 40,000 tons of metal were lost due to labor strikes in 1951 which affected production in all the major copper mining states. No such loss due to strikes occurred in 1952. The smaller production in 1952 is attributable primarily to lower grades of ore encountered by several of the large western producers.

The price of 35½ cents a lb established by Chile in June for copper exported from that country caused the release of copper temporarily withheld by Chile and stimulated a marked in-

Table I—U. S. Supply & Consumption of New Refined Copper, in Short Tons

Refined Production of New, Copper	1951*	Estimated for 1952**
From Domestic Origin.....	951,550	920,000
From Foreign Origin.....	255,429	255,000
Total New Refined.....	1,206,988	1,175,000
Imports of Refined Copper.....	238,547	340,000
Exports of Refined Copper.....	133,305	180,000
Refined Stocks at Year End.....	35,000	30,000
Apparent Consumption—New Refined.....	1,303,000	1,340,000

* U. S. Bureau of Mines Figures.

** Based on actual for 10 months and estimate for November and December.

crease in total imports of refined copper into the United States. It is estimated that imports of refined copper will increase from 238,547 tons in 1951 to 340,000 tons in 1952.

Exports of refined copper approached 180,000 tons, an increase of 35 percent over 1951. However, it should be pointed out that much of this increase is due to a special condition which involved shipping blister copper into this country for refining and re-export. This situation was also reflected in the volume of new copper refined in this country from foreign origins.

Producers' year-end stocks of refined copper remained at an irreducible level of between 30,000 and 40,000 tons.

Apparent consumption of new refined copper is estimated to be approximately 1,340,000 tons or an in-

a law which eliminated the 20 percent quota and granted the State the right to sell all the electrolytic, fire refined and blister copper produced by the American companies in Chile. The Central Bank of Chile was appointed the sole selling agent for this copper. But it was not until May 8, 1952 that Chile terminated its 12-month agreement with the United States. No copper sales were made to the United States between May 8 and June 12, 1952. On the latter date a new price of 35½ cents per lb f.o.b. Chilean ports was fixed. Chile is under no obligation to maintain the present price and may increase or decrease it at any time.

The new U. S. price being paid for Chilean copper was followed by a general increase in world prices. Many foreign operations which had been selling copper at the 24½ cents and

cents) of the foreign copper consumed, but on May 21, 1952 the OPS authorized copper importers to pay still higher prices for foreign metal, with permission to pass on to consumers 80 percent of the costs over 27½ cents a lb. This ruling was later changed, effective July 1, 1952, to permit passing on 80 percent of costs over 24½ cents a lb. Since consumers were allocated copper on the basis of 60 percent domestic and 40 percent foreign metal, the OPS order permitted brass mills an average price increase of 3.84 cents per lb of copper contained in their products. A special amendment to the OPS regulation permitted copper wire and cable producers an average price increase of 4.25 cents per lb of copper content.

Since copper consumers are not permitted to pass through any part of the higher price that they may pay

Table II—New Copper Mining Projects Will Increase Domestic Production by About 15 Percent

Owner	Mine Location	Estimated Investment	Estimated Starting Date	Estimated Peak Production Per Year	Govt. Contract Support Price Per Pound
Anaconda	Butte, Nev.	\$ 27,000,000	1952	45,000 tons	—
Anaconda	Yerington, Mont.	38,000,000	1953	33,000 tons	25½c
Copper Range	White Pine, Mich.	57,000,000	1954	35,000 tons	25½c
American Smelting & Refining	Silver Bell, Ariz.	17,000,000	1954	18,000 tons	24½c
Miami Copper	Copper Cities, Ariz.	15,000,000	1954	22,500 tons	23c
Kennecott	Deep Ruth, Nev.	14,000,000	1954	18,000 tons	—
Calumet & Hecla	Osceola, Mich.	6,000,000	1954	7,000 tons	24½c
Bagdad	Bagdad, Ariz.	14,000,000	1954	13,500 tons	24½c
Phelps Dodge	Bisbee, Ariz.	25,000,000	1955	38,000 tons	22c
Magma	San Manuel, Ariz.	111,000,000	1957	70,000 tons	24c
		\$324,000,000		300,000 tons	

crease of about three percent over 1951. According to U. S. Bureau of Mines, recovery of secondary copper from old scrap will probably not exceed 435,000 tons compared to 458,000 tons for 1951. This total of new and old copper equals 1,775,000 tons, compared with 1,761,000 tons in 1951.

Chile-U. S. Agree on Price

United States consumers are now buying the major portion of the copper produced by the American-owned mines in Chile at a price of 35½ cents a lb F.O.B. Chilean ports, or the equivalent of about 36½ cents a lb delivered Connecticut Valley. Under the circumstances, a brief outline of the events which resulted in the price jump may prove helpful.

On May 8, 1951 Chile reached an agreement with the U. S., whereby Chile was to receive an extra three cents per lb, above the official price of 24½ cents, on all copper exported to the United States. In addition, the agreement provided that the Chilean government was entitled to retain 20 percent of the copper produced by American-owned mines, which Chile could sell in markets other than the United States, for any price she could get.

On February 12, 1952 Chile passed

27½ cents price levels found the market demand quite strong at prices (N. Y. equivalent) ranging from 32½ to 36.15 cents.

Controls Hamper Supply

During the year which ended May 8, 1952 fabricators had been required to bear the entire higher cost (27½

for domestic copper in excess of 24½ cents, they have endeavored to limit their purchases of domestic copper to those producers who are governed by the 24½ cents ceiling. It is estimated that there is produced approximately 40,000 tons a year of domestic copper which is priced above the general ceiling, most of which is now being



Production losses due to work stoppages were smaller in 1952



Defense plus civilian requirements created heavy demand for copper

stockpiled by the Government. This copper is urgently needed by the fabricators and at the year end plans were being considered whereby the Government would absorb the difference in costs between the base and special price ceilings.

Price ceilings on scrap material seriously restricted production by custom smelters and refiners who depend on scrap for making electrolytic copper. Scrap dealers felt that the existing price ceilings were unrealistic and continued to withhold stocks until such time as more equitable prices prevailed. The short supply of scrap reaching custom smelters was restricted to an even greater extent when OPS permitted one producer a ceiling of 27½ cents a lb for copper produced from both primary and secondary origins.

New Mines Being Developed

Table II summarizes the pertinent data concerning ten new copper mining projects now under development in the United States. Each of the properties will receive either Government loans, purchase contracts, tax amortization benefits or combinations of the three types of assistance.

Only limited production is expected from the new projects before late 1953. The estimated annual peak production of 300,000 tons from the new developments would represent an increase of 32 percent if added to the U. S. mine production of 928,576 tons in 1951. However, by the time full production is reached at these operations, the loss in production from old mines will probably reduce the net gain in domestic production to about 15 percent.

Developments of the Greater Butte project by Anaconda and the Deep Ruth Mine by Kennecott have been projected without the benefit of purchase contracts with the Government. This leaves an estimated annual production of approximately 237,000 tons the producers of which are guaranteed a minimum price even though prices fall below profit levels for all other domestic producers.

In order to assure continuity of production from a number of small

marginal producers, the Government is presently helping these high cost operations by guaranteeing them prices ranging from 27½ cents to 34½ cents a lb.

The year 1952 witnessed progress in the continuing search for new methods of increasing the recovery of copper from materials which are presently amenable to economic treatment, and for processes which will recover copper from sources which cannot be treated at a profit by conventional methods. An example of the latter is the new technique, developed by Chemical Construction Co. and affiliates, which involves the chemical leaching and refining of copper, cobalt, nickel and manganese ores, or the scrap of copper and brass, to produce high purity metal powders. The process promises an economic method of treating some ores and scrap which were formerly considered too difficult to process by conventional methods.

According to the "Paley Report," the United States is going to need all the copper it can mine and recover during the next 25 years because it is estimated that copper consumption will increase about 45 percent or to a level of 2,500,000 tons by 1975. The Report estimates that present ore reserves, plus extensions and dis-

coveries, will enable the U. S. to maintain an average annual capacity of approximately 800,000 tons over the next 25 years. The difference of 1,700,000 tons will have to be made up by recovery of scrap, plus increased imports of foreign metal.

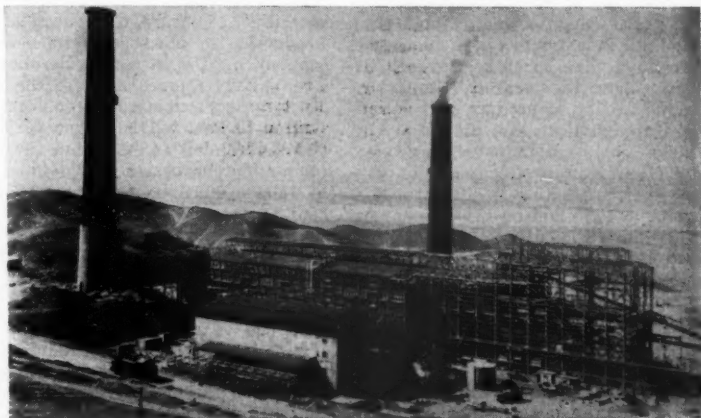
Situation at End of Year

On November 3, 1952, Senor Carlos Ibanez del Campo of the Nationalist Party was inaugurated as the new President of Chile, ending the 14-year regime of the Radical Party. Experienced American businessmen in Chile are generally agreed that Senor Ibanez is a strong and able leader who fully appreciates the economic advantages of having the large copper mines operate at a profit.

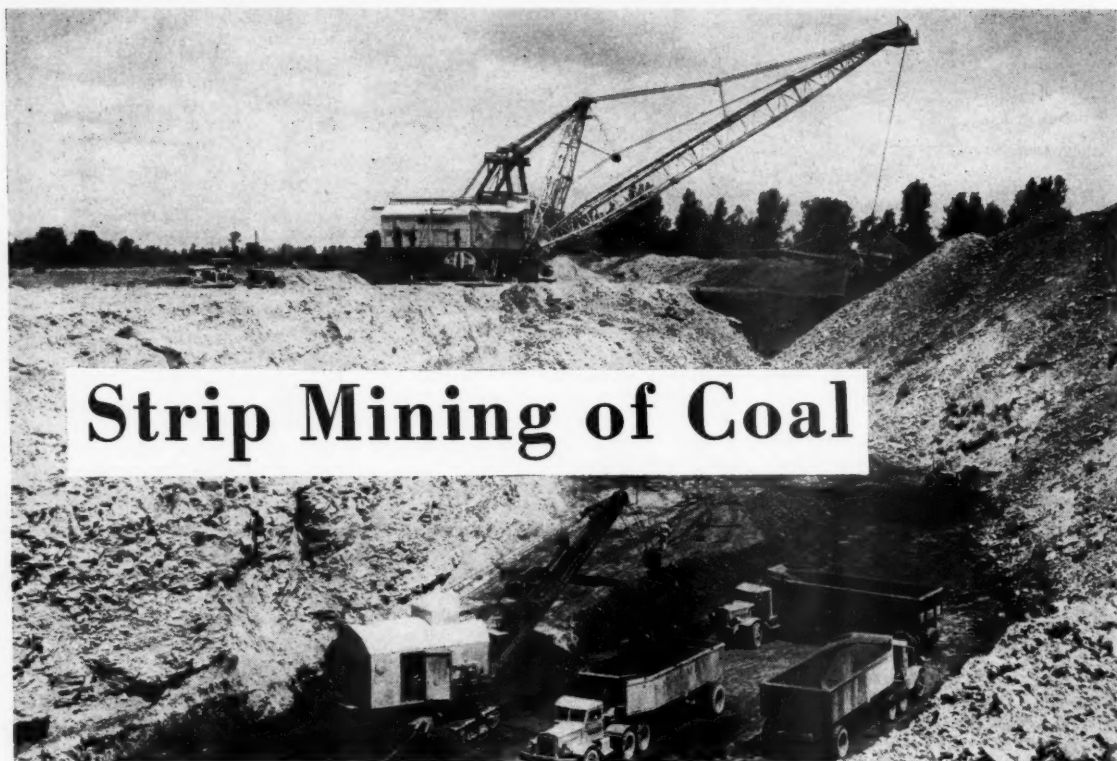
By early December, the world's copper supply had increased enough to permit 18 European countries, which comprise the Organization for European Economic Cooperation, to remove all former restrictions on the use of copper in Europe. Thus, it was becoming increasingly evident at the end of 1952 that the demand for copper, outside the U. S., had eased considerably.

Various Washington officials have indicated that copper requirements for the defense program have about reached their peak. Even as early as August, the United States had removed copper from the list of critical materials and placed it in the category of materials in approximate balance.

During the closing days of 1952 the Government refused to raise or suspend ceilings on domestic copper. Economic Stabilizer Michael DiSalle summarized the Government's position in the following statement. "In view of the continuing critical shortage of this basic defense material, suspension of ceilings is out of the question. And in view of the favorable current earning position of the industry, no increase in ceiling prices is justified."



United States consumers bought a major portion of the copper from American-owned mines in Chile



Strip Mining of Coal

Strip mines produced more than 110,000,000 tons in 1952

Production Approached 25 Percent of Total Coal Output and Shows Every Sign of Further Increase

By FRANK F. KOLBE

President
The United Electric Coal Cos.

THE important factors that will determine the outlook for strip coal are the demand for energy, the demand and supply of competing fuels, and the efficiency of strip coal production relative to deep mining. While the strip mine industry has been operating more days than most deep mines, it is not operating near its capacity, and the ability to produce will not in any way handicap consumption. In Illinois, the strip industry increased production from 11.6 percent of the total coal production in 1930 to 30.8 percent in 1950 and to 32.7 percent in 1951 when 18,309,970 tons were produced by strip mining in the state. In 1952, it is estimated that the strip production will be approximately 17,000,000 tons, out of the total estimated production for the state of 43,000,000 tons, or nearly 40 percent.

In 1940, the United States strip mine production was 43,000,000 tons. This expanded to 101,000,000 tons in 1944. In 1948, the strip production

was 140,000,000 tons, or 39,000,000 tons more than the war time high, whereas in 1948 underground production was off 60,000,000 tons from its war time peak. In 1951, strip mines produced 118,000,000 tons out of a total production of 534,000,000 tons, or 22 percent of the total in the nation. Preliminary figures indicate that the 1952 total production of coal in the United States will be about 462,000,000 tons and it is estimated that the strip mine production will be in excess of 110,000,000 tons or almost 25 percent of the total production.

Utility Coal Demands Up

The use of coal, oil and gas increased 59 percent in the decade 1940-1950. This use of energy continues to increase. One of the largest increases is that due to the growing electric generation requirements. The installed generating capacity at the end of 1951 was 75,444,276 kw; by the end of October, 1952, the installed capacity

had increased to almost 80,000,000 kw and by the end of 1952 was expected to be at least 81,000,000 kw, an increase in installed capacity of 6,000,000 kw in one year.

Present plans call for a total of 12,910,000 kw of new generating capacity in 1953, 11,494,000 kw in 1954 and 8,800,000 kw in 1955. The total increase in the four years from 1952 through 1955 is expected to be 41,113,000 kw, or an increase of about 55 percent of the December 31, 1951 figure. In 1951, the electrical utilities consumed about 105,681,951 tons of coal and with this big increase in generating capacity, they might consume 30,000,000 or 40,000,000 tons more than this in 1956. The use of coal by the TVA alone is expected to increase from about 3,000,000 tons in 1952 to 18,500,000 tons in 1956. Back in the 1920's and 30's, the electric industry was growing rapidly but at that time it was growing on a small base. Now an increase percentage-wise in the use of electricity amounts to a tremendous increase in tons of coal used.

Railroad Market Shrinks

The railroad market for coal continues to shrink. In 1944, the railroads consumed 136,000,000 tons of coal. It is estimated that this figure will be around 40,000,000 tons for 1952. Last year, demand from the



Mining up to 1000 ft in from the highwall, this machine is directed by remote control

railroads decreased 14,000,000 tons. At this rate, there will not be much left of the railroad fuel market in a few years. Many coal mines which formerly sold a good percentage of their output to the railroads are not selling any today, but are nevertheless operating at near capacity. They have replaced the railroad business with utility and industrial customers.

In the decade 1940-1950, the use of oil and gas almost doubled, but the use of coal also increased. Oil and gas will continue to increase but coal should continue to get a large share of the business. The report of the President's Materials Policy Commission released in June 1952 estimates that by 1975 the demand for coal will have increased to 85,000,000 tons, a 56 percent increase with large in-

creases in oil and gas consumption also. The impact of oil and gas differs in different parts of the country. For instance, coal sells at the mine for \$4.50 per ton and bears a \$4.50 per ton transportation cost to New York, making a total delivered price of \$9 per ton, fuel oil is a serious factor, but in Chicago, where coal delivered sells for \$5 a ton, fuel oil cannot compete. Natural gas, however, has had a serious disruptive effect on the coal industry as large quantities of it have been dumped at any price in order to use existing pipelines.

Over-all Picture Bright

In Illinois, the Natural Gas Storage Company of Illinois is spending \$17,000,000 on the first unit of an underground storage system at Kankakee

to take "off peak-load gas" and store it for the winter demand. It is expected that when the project is completed, the investment will be \$42,000,000. This gas storage company is part of the Natural Gas Pipeline Co. of America and the Texas-Illinois Natural Gas Pipeline Co., all of which are subsidiaries of the Peoples Gas Light and Coke Co. of Chicago. This storage program will make it possible for the gas companies to sell more gas to the householders for domestic use, for which use it is especially fitted, and will result in reduced sales to industries for industrial use and to large buildings for heating purposes. Gas companies have been selling gas at dump rates ranging from 11 to 18 cents per thousand cu ft which is equivalent to \$4.00 or less for a ton of coal. This is less than the cost of new purchases of gas in Texas plus transportation to Chicago. To use natural gas for replacing coal under such conditions is not only poor business but a very bad use for an irreplaceable natural resource. It is a waste of natural gas to burn it under boilers where coal is available.

One of the largest developments in strip coal technique this past year has been the use of augers to mine out coal from the high wall. These augers can recover 100 to 200 ft of coal at a very low cost. The Carbide & Carbon Chemicals Co. has developed a continuous miner with electronic controls which does the same work as an auger but which can mine a thousand feet or more.

The strip coal industry since its inception has displayed great vitality. This vitality and progressiveness together with the increased demand for energy assure it of a bright future.

Uranium Program

(Continued from page 84)

Green River; San Rafael Swell and Henry Mountains, Utah; Lukachukai Mountains, Ariz.; and Shiprock, N. M. Interesting new discoveries of carnotite deposits by Navajo Indian prospectors near Cameron, Ariz., are yet to be evaluated.

The importance of the relatively new Grants area of New Mexico, where a large deposit of uranium ore in Todilto limestone was first reported in 1950, was enhanced by the discovery during 1952 of good-size deposits in sandstones near Laguna, southeast of Grants. At the Grants buying station, opened in June 1952, ore is being stockpiled for later treatment in the Anaconda plant now under construction.

Early in December ore was first delivered to the new buying station at Edgemont, S. D. Several carloads of selected ore from the South Dakota

Plateau-type deposits had been shipped earlier to the Plateau mills. Airborne and ground exploration during 1952 disclosed several new deposits east and west of the original Craven Canyon discovery. Diamond drilling is now under way.

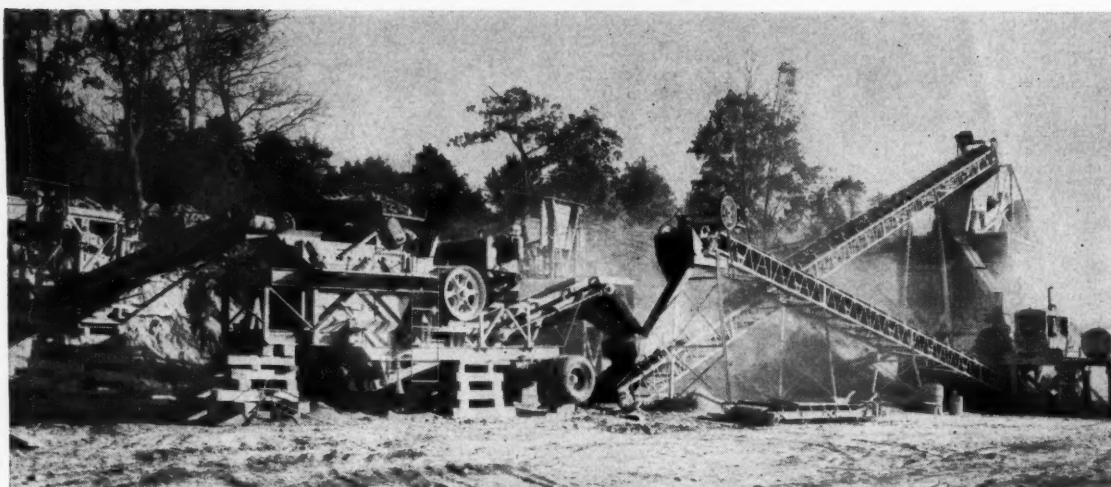
Northwest of Edgemont, in the Powder River Basin of Wyoming, the U.S.G.S. in 1952 found a large number of very small high-grade deposits, partly in the form of mineralized tree trunks, some of which will doubtless be mined. The possibilities of finding additional minable deposits in Wyoming are good.

Surrounding the Plateau and extending far to the northwest is a scattered array of vein-type uranium deposits. These have been studied and explored vigorously in the hope that an American Shinkolobwe might develop. However, with the exception of the Marysvale, Utah, deposit, which is a truly remarkable phenomenon and a steady producer of good ore, efforts to develop significant tonnages in these

vein deposits have been rather disappointing. Several small deposits of good grade have been found in the Boulder Batholith near Clancy, Mont., in the Front Range of Colorado, at Lusk, Wyo., and at several places in Arizona. Exploration of vein type deposits is to be intensified in the future.

Finally, mention should be made of the progress in recovering uranium from Florida phosphate rock. In 1952, at the Blockson Chemical Co. plant in Peoria, uranium was first recovered as a by-product of phosphoric acid manufactured from Florida phosphate rock. Other plants will be built in Texas and in Florida.

The need for self-sufficiency in uranium is forcing the AEC to consider lower grade sources, embodied in the vast reserves of uraniferous black shales and lignites with which our country is endowed. Again it is necessary to call in the imaginations of our best scientists and to hope their visions will prove true.



Concrete aggregate production, including sand and gravel, accounted for biggest volume of mineral industry output

Industrial Minerals

Expansion In all Branches of Nonmetallics Industry
Was Worldwide

By JOSEPH L. GILLSON

Geologist
E. I. du Pont de Nemours & Co.

DEVELOPMENTS in the Industrial Mineral Field during 1952 were so numerous and most segments of the field were so active, that only brief attention can be given to each in an article of this length.

ABRASIVES—The Norton Co. has introduced "for fixed feed grinding," resinoid bonded silicon carbide wheels to substitute for diamond wheels. The same company has also evaluated "electrolytic assistance in diamond wheel grinding" to reduce consumption of diamond bort. High purity zirconia has been introduced by Norton as a polishing medium for glass. Producers of almandine garnet have learned that by heat treating the fine fractions, improvement in cutting ability was obtained. The industrial diamond situation was improved somewhat by expansion of production in the Belgian Congo and Tanganyika.

AGGREGATES—The production of sand, gravel and crushed rock for road building and for concrete is the largest volume business in Industrial Minerals. Average sand and gravel prices remained constant and crushed stone rose one cent per ton. Volume has been high, probably two percent higher for sand and gravel and up four percent over 1951 for crushed stone bringing the total for sand and gravel to about 400,000 tons and for crushed

stone to 294,000,000 tons (including 29,000 tons of agricultural limestone). Atomic Energy plants required large tonnages. Hungry Horse Dam in Montana, the world's third highest and fourth largest, took 3,100,000 cu yd of concrete. Pine Flat Dam in California, the eighth highest in the world, presented some interesting problems in aggregate production, especially the removal of roots and wood fragments. The Chief Joseph Dam in Washington was another big job where long belt conveyors were used exclusively. The Falcon Dam on the Rio Grande was unusual in that pozzolanic material made from volcanic ash was added to neutralize high alkali cement. The urgent demand for more and better highways led to passage in June of the Federal Aid Highway Bill for \$1,385,000,000 for the fiscal years 1954-55.

The problem of road construction is receiving more study in the "Washo" test road completed in September between Pocatello, Idaho, and Ogden, Utah. Ten Western States, the U. S. Bureau of Public Roads and other agencies are cooperating in this test.

In rock quarrying, jet piercing was tried for the first time in granite at Rock Chapel, Ga. One such rig has replaced three churn drills.

Light weight aggregates are much

in the news. In February, the Waylite Co. put into operation an expanded slag plant at Bethlehem, Pa. Armour Research Institute brought out a new product called "Kanamite." Mineral Products Co. at Kansas City sinters a raw clay into a product called "Lite-Wate." Light weight made from pumice in the Eiffel region of Germany is becoming important, and in both Sweden and Denmark extensive use is made of "foam techniques" in making concretes. In England, a foaming process has been developed called "Phomene."

The perlite industry continues to grow in the west and southwest. The F. E. Schundler Co. of Joliet, Ill., acquired a large deposit in the "No Agua" mountains of northern New Mexico, and built a processing plant at Antonito, Colo. The El Paso Perlite Co. is preparing to mine a big deposit north of Gage, N. M. Other active producers are: United States Gypsum at Lovelock, Nev.; Dant and Russel now Kaiser Gypsum, St. Helens, Ore.; Combined Metals Reduction Co., Castleton, Nev.; Alexite Eng. Co., Florence, Colo.; Great Lakes Carbon Co., Socorro, N. M.

Total production of slag for use as a concrete aggregate was off five percent from last year. Total 1952 output of the slag industry was about 28,000,000 short tons worth \$35,000,000.

ANORTHOSITE—It was announced that the U. S. Bureau of Mines will operate an experimental alumina plant at Laramie, Wyo., using anorthosite and other low grade aluminous ores.

ASBESTOS—Canadian and world production of fiber is expected to approach, but probably not exceed, that of 1951. The demand for Groups 3, 4 and 5 Canadian chrysotile equalled the supply during nearly all of the year, but there were several months when there was some excess of groups

6 and 7. Average prices were 5 to 12 percent higher than the yearly prices for 1951.

Interest in new deposits has been worldwide. Some steps have been taken for exploration programs and new production facilities. Among these are:

The Colonial Sugar Refining Co., Australia, in the Wittenoom's Gorge District of Western Australia.

Large, but unproved, reserves of anthophyllite are being investigated in the Teite Hills region, about 120 miles from Mombasa, Kenya, British East Africa.

A study of the asbestos possibilities in Yugoslavia has been made. The potentialities are not large.

Active exploratory drilling has been carried out east of Matheson, Ont. The Colonial Asbestos Corp., Ltd. has been active and Johns-Manville has been operating on the Bird-Ginn group of claims.

The Dominion Asbestos Co. has continued development work in the Mc-Dame District, Northern British Columbia.

NPA order M-96 went into effect January 17, 1952, to restrict the commercial use of chrysotile.

An organization, Rhodesian Asbestos, Ltd. was effected to mine and mill chrysotile fiber at the Mashaba and Shashi mines in the Victoria District, Southern Rhodesia.

Defense Minerals Procurement Administration announced plans (DMPA 63, August 28, 1952) for the establishment of a custom mill and purchasing facilities in Arizona, to handle chrysotile ore for small independent producers, mostly in the region north of Globe. The proposed mill is to produce a minimum of 1000 tons per year of stock-pile specification fiber, to be purchased under contract by the Government. Government funds have been proposed for the purchase of 5000 tons of No. 1 grade chrysotile spinning fiber and for 35,000 tons of shorter grades. Western Chemical is operating the dumps of the former holdings of Johns-Manville at Chrysotile, Ariz. The Arizona Asbestos Producers Association was organized as a group of small independent producers to study marketing, processing, etc.

Johns-Manville Corp. and the Cape Asbestos Co. Ltd. of London have formed an organization, Marinite Ltd., to manufacture "Marinite" near Glasgow, Scotland.

In the Black Lake District of Quebec, the United Asbestos interests and Lake Asbestos of Quebec, Ltd. are reported to be considering the erection of a 4000-tpd milling plant. The Johnson's Co. of Thetford Mines, Quebec, has started construction of a new 4000-tpd mill at their Black Lake property. Production is expected in 1953.

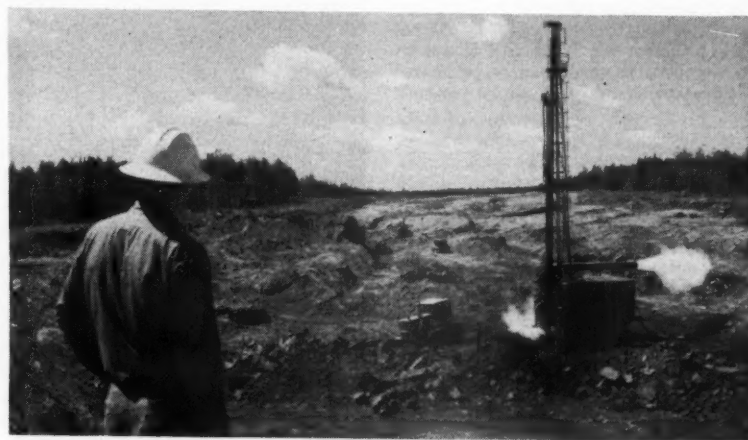
Activity has started on asbestos in

Colombia. Asbestos Colombianos S. A. was organized to explore and develop deposits in the Department of Antioquia. Active exploration began in December, 1952.

European asbestos cement manufacturers combined with the Israel-Miami group to form the Israel Asbestos Cement Industries, Ltd. The output of asbestos cement products, particularly pipe, was increased.

Ground was broken and foundations laid for the first half of the new mill of Canadian Johns-Manville, Asbestos, Quebec. First production is expected in 1954, with completion of the mill in 1957. This mill will have a capacity of over 22,000 tons per day, and will be the largest operating unit of its kind in the asbestos industry.

Production of anthophyllite in the Carolinas has increased. In addition to the older producers, the Mining and Milling Corp. of America has put in a pilot plant at Spruce Pine, N. C., to operate on ore from the Blue Rock Mine.



Jet piercing was introduced into industrial minerals field

BARYTES—Production of barytes, principally for oil-well drilling mud was very high, and DMPA has set a goal of 1,365,000 tons of annual production by 1955. The 1951 production was about 500,000 tons. The high pressure oil fields and very deep drilling have made the demand for these muds. Magnet Cove Barium Co. is planning to build a mill, of 60,000 tons annual capacity at New Orleans, using ore, mainly from Latin America, and the Baroid Division of National Lead is planning a mill of similar capacity at Corpus Christi, and expansion at Malvern, Ark., also. The Super Bar Company is doubling capacity at Potosi, Mo. Arizona Barite Co. opened a deposit 20 miles south of Aguila, Ariz. Nova Scotia continues to be a very large producer, principally at Walton, but a new company, Maritime Barytes Ltd. is recovering ground barytes at Brookfield, Colchester County.

In contrast with the large demand on this side of the Atlantic, English producers have had to curtail because of excessive stocks. These include the Devonshire Baryta Co., the Silverband Mine and the Cowgreen Mine.

BORAX—American Potash and Chemical Co. is producing "Tronabor" (crude pentahydrate borax) in commercial quantities. This is used in fertilizers, supplying the plant need of boron.

There have been important developments in the production of elemental boron, as a metallurgical product. It is claimed that boron reduces the quantities of Ni, Mo, V, Cr, etc., needed in alloy steels. This subject is out of the field of Industrial Minerals.

CLAYS-NORTH CAROLINA—Production of China Clay in Western North Carolina for 1952 has been a little under that of 1951. The mines in the Spruce Pine district accounted for 25,000 tons of refined kaolin, most of which was sold to the potteries

and manufacturers of porcelain and table-ware. The fiber-glass industry used 9000 tons. A few hundred tons of halloysite were mined and refined also. It is recovered from small lenses found in the deposits of clay.

Improvements in purification plants have been responsible for a higher recovery of mica of which a little more than 10,000 tons, dry-ground, have been prepared and sold during the year.

In California, a new mill has been built on the south shore of Owens Lake to process bleaching clays. The Filtrol Corp. is continuing to produce halloysite at the Dragon Consolidated Mine in Utah. Apex Smelting Co. in Chicago has learned how to produce aluminum-silicon alloys from the direct smelting of clays. A plant is to be built at Springfield, Ore., where there is a deposit of high alumina clays, and waste wood chips are available for fuel.

CLAYS-BENTONITE—The large demand for oil-well drilling muds has stimulated the production of bentonite.

At Graybill, Wyo., the Magnet Cove Barium Co. opened a big deposit, but to ship the bentonite across the Big-horn River, a 1600-ft aerial tramway had to be built. Colo-Tex Mining and Engineering Co. completed a bentonite processing plant at Las Animas, Colo., obtaining the crude from a deposit in the southern part of Bent County, Colo. South Dakota has continued to be one of the principal producing states. The Baroid Sales Division of the National Lead Co., the American Colloid Co. and the Eastern Clay Products Co. operate mines and processing plants in the State.

DIATOMITE—World conditions on diatomite were considerably upset by the seven-month shutdown at the Johns-Manville plant, Lompoc, Calif. Production was resumed in late October and at year's end was back to normal.

In February, increased production facilities at the Johns-Manville plant, Lompoc, and a new plant of the Great Lakes Carbon Co. (Dicalite Division) at Lompoc, stepped up United States production capacity about 50 percent.

Some imports of foreign diatomite into the United States from France, Germany, Kenya and Denmark helped alleviate the shortage here, but the total tonnage was small and is not expected to continue in 1953.

Commercial requirements for processed diatomite products in the United States have increased steadily for the last several years, and production capacities have not been equal to the requirements, but from 1953 on this will be corrected.

DOLOMITE—Kaiser Aluminum and Chemical Corp. at its large plant at Salinas, Calif., installed a Heavy Media Separation plant which handles 250 tph of plus $\frac{1}{4}$ in. feed. Ferro silicon is the medium, used in an 18-ft diam Meneco cone. The sink product analyzes .32 percent SiO_2 and .56 percent R_2O_3 , whereas the float products carries over 14 percent SiO_2 and 1.70 percent R_2O_3 .

FELDSPAR—Outstanding news in the feldspar industry involved changes in ownership of the two largest producing companies. United Feldspar and Minerals Corp. lost its entire plant at Spruce Pine, N. C., by fire on January 8, 1952, and decided not to rebuild. Later in the year, United sold controlling interest to American Encaustic Tiling Co. The purchase included the associated companies, Carolina Pyrophyllite and Glendon Pyrophyllite. Consolidated Feldspar Corp. sold most of its assets to International Minerals and Chemical Corp.

Use of froth flotation to recover feldspar continued to increase, both for the glass trade and for pottery.

One plant is in operation in California, using beach sand as the feed.

FLUORSPAR—Developments in the fluorspar industry occurred in every major field, stimulated by increases in demand for both metallurgical and acid grade, and by the major discoveries in northern Mexico. It appears to some observers that the increased capacity of plants to produce acid grade may have been overdone, the "third round of aluminum expansion" being anticipated two or three times over.

In the Illinois-Kentucky district, the Victory was sold to Martin Schwerin, and the Yingling and Rose Creek properties and the old Crystal mine to the Minerva Oil Co. The Minerva Co. completed a new 420-ft haulage drift in its No. 1 mine which is equipped with a 30-in. conveyor belt. Alcoa Mining Co. has reopened the Good Hope mine at Rosiclare, Ill., which adjoins its Blue Diggings vein.



Foote Mineral Co. in North Carolina—greatest domestic source of lithium

In Kentucky Alcoa has reopened the old Silver Royal property on the Cumberland River. It is deepening the Bailey shaft at the Klondike mine. The Aluminum Ore Co. is to increase its productive capacity for synthetic cryolite by approximately 11,000 tons. An agreement with the government provides for the sale of 42,600 tons of synthetic cryolite between 1952 and 1956 at a base price of 13.9 cents.

U. S. Steel is installing a heavy media plant at Mexico, Ky., to produce 140 tons of concentrates per eight hours. Pennsylvania Salt and Manufacturing Co. has acquired two fluorspar mills in the Kentucky Mining District. The old Nancy Hanks Mine at Salem, Ky., has been reopened by two Marion operators.

A strike shut down the Alcoa, Minerva Oil and Rosiclare Lead and Fluorspar for several weeks.

Pennsylvania Salt and Manufacturing Co. is expanding its facilities at Calvert City, at an estimated cost of \$8,000,000. The expansion includes an electrolytic chlorine-caustic soda unit.

In the West, Kaiser Aluminum and Chemical Corp. acquired the old Baxter mine, 70 mi southeast of Fallon, Nev., and built a flotation plant on the Carson River. It is estimated that Kaiser will need 31,000 annual tons of acid grade concentrate. Currently General Chemical Co. is reported manufacturing synthetic cryolite for Kaiser from the Fallon concentrates, but Kaiser is constructing a plant at Mead, Wash. This will include a cryolite recovery unit to recover part of the cryolite lost in pot linings.

Also in the Fallon district, Victory Divide Mining Co. has acquired seven fluorspar claims. The Beatty mine in Nevada is continuing in small but regular production. In Montana, the U. S. Steel Corp. took a 99-yr lease on a newly discovered property near Darby. Another new property in Ravalli County, Mont., has been found by the U. S. Bureau of Mines.

In New Mexico, the Shattuck-Denn

Mining Co. has leased its Zuni fluorspar mines to its former foreman, who will continue to operate them. Zuni is continuing to operate its mill at Los Lunas, on custom ore, obtained partly from Arizona and from Sonora, Mexico.

In Colorado, Ozark Mahoning began production at its new flotation plant at North Gate in July. This plant will have a capacity of about 20,000 tons of acid grade concentrate per year. The sale of the output is guaranteed by the Government, at a price of \$60 per ton, North Gate.

DMPA has loaned \$1,250,000 to the St. Lawrence Fluorspar Co. to build a flotation plant at Wilmington, Del., to treat crude ores brought in by water, recovering 50,000 tons of acid grade concentrates annually. The contract covers guaranteed purchases of 150,000 tons over a four-yr period from the date of the contract. To supply the ore, St. Lawrence is developing its Blue Beach Mine at St. Lawrence, Newfoundland, and is installing a heavy media plant, so that

the product shipped to Wilmington will be high grade. St. Lawrence hopes to supplement its own production with ore purchased in Europe.

The fluorspar area in Coahuila, northern Mexico, which was announced last year, was expanded by several discoveries in entirely new areas, so that the reserve may be much larger even than originally estimated. The original discovery was on the Encantada ranch, about 40 miles south of the Rio Grande, and east of the "Big Bend" of that river. This area was quickly extended to include an even more attractive section on the adjoining Buena Vista ranch. Shortly thereafter widely scattered vein deposits were found south and southwest of the border town of Bouquillas, which is almost due north of Encantada. Then an extensive area nearly due east of Encantada was found on the El Tule ranch, and toward the end of the year, an extension of that

the minimum required by Mexican law. Asarco is building a fluorspar flotation plant at its coke oven plant near Rosita, and has been buying ore from local producers. Sr. Adolfo Romo, who had taken up a large number of claims in the Encantada area, has been buying milling equipment for a small flotation plant to be built at Muzquiz. A jig mill has been operating at Bouquillas, and because of the high quality of the ore has even produced some acid grade in this way.

In other parts of Mexico there has been some other news in fluorspar. The long strike at the Azul mine, south of Mexico City, was ended in May, but with a very heavy penalty on the operating company in lost wages and strike costs. The Azul was formerly the major producer in Mexico, but the easily minable ore is largely exhausted. Lack of water is a serious deterrent. Production in the Zacualpan district, also in the

near Civitavecchia, which is a new and very promising discovery. Prealpina is the largest producer in Italy. Its mines are at Brescia and Bergamo and its mill is at Torgata. Prealpina was granted a large DMPA loan during the year to expand its production to about 3000 tons of flotation concentrate per month.

In Western Germany there are 11 principal producers, of which Gewerkshaft Finstergrund, Fluor-chemie in Baden and the Vereingte Flussspatgruben Stulln in Bavaria are the most important. The latter is the largest producer, making about 2000 tons of acid grade and 1000 tons of metallurgical grade per month. Fluor-chemie has just built a flotation plant at Karlsruhe, largely with funds loaned by MSA. The crude ore comes from a number of mines. Gewerkshaft Finstergrund has been an important supplier of acid grade to the United States. The company has a number of mines in the southern part of the Black Forest, centering around the village of Totran. The mines are said to have very substantial reserves. The mill is located at Utzenfeld, and has a capacity of about 110 tpd.

News on fluorspar in the Russian zone has been obtained from refugees arriving at the Naaburg district which is only 30 km from the Iron Curtain. There are three flotation mills in East Germany. Russia is getting most of its own requirements from mines in the Urals, and the output of these East German mills is available for export—some of it has come to the U. S.

Estimated 1952 West German production is 35,000 tons of acid grade and 80,000 tons of metallurgical. Of the acid grade about 20,000 tons will have been exported, mostly to the U. S.

The principal operators in Spain are Minerales y Productos Derivados, S.A. near Barcelona, Felix Cifuentes in Asturias and the company called Fluoruros, which operates a mill at Pinzales recently enlarged and modified following suggestions of American technicians.

In Morocco, a newly developed deposit is the El Hammam, in central Morocco, 40 km southwest of the port of Meknes.

DMPA negotiated with the Pennsylvania Salt and Manufacturing Co., sole agents for the importation of natural cryolite, to expand operations in Greenland. Thirty-one thousand long tons will be shipped to the U. S. during 1953 instead of the usual 12,000 tons.

GEMS AND PRECIOUS STONES
—A large diamond, weighing 283½ carats, came from the Premier Diamond Mine near Pretoria, South Africa during the year. It is valued over £100,000. Diamond mining in



Portable crushing plants helped reduce costs in nonmetallic mineral mining

area was found. Meanwhile an entirely new, and different type of deposit was found at a district called Paila, northwest of Saltillo.

In all of the deposits, the ore is remarkably high grade, and shipping ore was produced with no capital equipment beyond a few picks, shovels and wheel barrows. Production has been spectacular, and had it not been for the steel strike, and then just plain overproduction, the district might have yielded 150,000 tons in 1952. It probably did yield between 100,000 and 120,000 tons.

Nearly every American fluorspar producing company and consumer visited the area. American Smelting and Refining and Reynolds Metal optioned a large number of claims. Asarco finally abandoned all but one of theirs, Reynolds gave up in the Encantada area, but was still exploring around Bouquillas at the end of the year. E. I. du Pont de Nemours & Co. formed a Mexican subsidiary called Minera Rosala S.A. de C.V. and has acquired claims both at Buena Vista and El Tule, but does not contemplate immediate production beyond

state of Guerrero, is always about to start, but the inaccessibility of the area has been a serious handicap. Mining in northern Sonora, south of Douglas, Ariz., has continued, and some important reserves are reported.

In Europe there has been much activity. In England, the area at Wear-dale in Durham has been active particularly by Fluorspar Ltd. At Rook-ope, the Weardale Lead Co.'s mine has been doing very well. At the head of the valley, the Blackdene mine is being reopened. In Cumberland, Anglo-Austral Mining Co. has continued to operate a flotation plant, and in Derbyshire, Constables Ltd. and the Derbyshire Stone Co. have been producing.

In Italy there are three principal producing companies, Mineraria Prealpina, Montecatini, and the Societa Monreale. The latter has its mines at Sardara, in Sardinia. It is producing about 500 tons a month of hand picked acid grade. Montecatini is operating two mines, one called Prestavel at Cavalese and another called Corvara north of Belzano. It plans to start operations at its Sossa mine,

South Africa is penalized by a newly imposed tax of nine shillings in the pound. As a result DeBeers has decided to abandon some developments that had been under way.

Alluvial production in Southwest Africa has been stimulated by using 40 surplus Sherman tanks to remove sand dunes at the mouth of the Orange River. Another important producer in Southwest Africa is Industrial Diamonds, South Africa Ltd. Exports from Tanganyika rose sharply because the Canadian diamond producer, Dr. John Williamson, reopened the Mwadui mine, following a new agreement with the Diamond Trading Co. There is one other important producer, in Tanganyika, the Almasi Mine. U. S. loans to the Grivar Exploration and Development Corp. are expected to stimulate production near the mouth of the Ubangi River in French Equatorial Africa. In the Belgian Congo, the Minière du Beceka has nine workings on the Lubilash River and not only has increased output, but has expanded its reserves as well.

A new source of jade has been found in Alaska, some of exceptional quality. The Imperial Jade Co. of Kotzebue will operate the deposit which is in the Cosmos Hills, 150 miles northeast of Kotzebue.

GYPSUM—In 50 years has become one of America's indispensable minerals. Since World War II, U. S. Gypsum has spent \$80,000,000 for new plants, and improvements at old ones. New plants have been built at Norfolk, Va.; Plaster City, Calif.; Sigurd, Utah, and Empire, Nev. At Sweetwater, Tex., original capacity has been increased threefold, at Fort Dodge, Iowa, capacity has been doubled. Expansions took place at Hagersville, Ontario, for the Canadian market, and at Jacksonville, Fla., for the southeast. A new loading station was built at Hantsport, Nova Scotia, to load vessels at a rate of 6000 tpd. The Gypsum Association reported on a new fireproof construction for light steel frame buildings. Gypsum lath has been in great demand, because solid gypsum partitions are substituted for closely spaced wooden studs.

National Gypsum at Buffalo, N. Y., has had a million dollar expansion at Clarence Center, N. Y., and National City, Mich., and is building a Research Center in Buffalo. Certainteed Product Corp., Columbia Gypsum, Kaiser Gypsum and Celotex Corp. have all expanded.

INSULATING MATERIALS — A new refractory mineral wool has been announced by the Carborundum Co. It consists chiefly of mullite ($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$). A \$500,000 plant is under construction to manufacture this insulator. Tests showed that 30 percent less electric power was required to

maintain a furnace at a temperature of 2500 degrees F lined with this new fiber, as compared with a normal brick lining.

LIME—A 10 percent increase in lime output was anticipated for 1952, which is expected to reach 8,250,000 tons for the year.

LITHIUM—Demand for lithium chemicals is increasing greatly. Calculated as lithium carbonate, the requirements expressed in thousands of pounds were 2584 in 1950, 3500 in 1951, 6000 in 1952, and are expected to grow to 10,000 by 1955. There are four lithium chemical producers in the U. S., American Potash and Chemical Corp., California; Foote Mineral Co., Philadelphia; Lithium Corp. of America, Minneapolis, and Maywood Chemical Works, Maywood, N. J. The first company produces lithium salts as a by-product at Searles Lake, and has available annually about 1,200,000 lbs expressed as lithium carbonate. The rest of the demand is supplied from spodumene, produced at Kings Mountain, N. C., and in the Black Hills, S. D. Foote Mineral Co. operates the deposit at Kings Mountain and is currently expanding its operation there from 350 to 400 tpd of spodumene to 600 tpd. Foote has built a chemical plant at Sunbright, Va., for which it received a certificate of necessity of \$2,515,000 with 80 percent amortization. In South Dakota, Lithium Corp. of America is the largest producer. It has a heavy media plant at the Edison Mine, near Keystone, and a 200 tpd flotation plant at Hill City, which started operations early 1952.

Another interesting current development of lithium is in Southwest Africa. There is an area called Kari-bib, where mines called the Rubikon, Helikon and Kahlsbann were taken over by Lithium Mines Ltd. of Windhoek, S.W.A.

MAGNESIA — Three sea-water plants are now producing magnesia: Dow Chemical on the Gulf Coast, Kaiser Aluminum and Chemical Corp. at Moss Landing, Monterey Bay, Calif., and a plant at Cape May, N. J., operated by the Northwest Magnesite Co., a subsidiary of Harbison Walker and General Refractories Cos. A new magnesia insulation was announced. This is made up 85 percent of partially hydrated magnesium carbonate, and 15 percent asbestos fibers. In the new process, needle-like crystals of magnesium carbonate are mixed with the asbestos fibers and water, and cast into molds. The mixture is converted to the basic hydrated carbonate by the application of heat, while in the mold. In this way coverings for pipe sizes of large diameter are possible, the density is low, and dimensional stability is improved. The product is being produced by four manufacturers.

MICA AND ASSOCIATED PEG-MATITE MINERALS—The demand for scrap mica continues strong, but that for sheet mica has been weak. Indian mica producers have been alarmed by the drop in purchases by U. S. buyers. The three Indian states of Bihar, Rajasthan and Madras account for 80 percent of the total world output of mica. The Indians blame the use of mica waste at low prices as being responsible for the falling market. Two U. S. firms are planning to produce commercially a mica paper, or built up mica, from scrap mica. There has been some progress in synthesis of mica, making a fluorine bearing magnesia mica, but sheets suitable for electrical use have not yet been made, but have resulted in a "hot pressed mica" suitable for some electrical insulators. At the same time that sheet mica imports have dropped, the DMEA has been attempting to stimulate production of mica in the United States. Seventeen individuals and companies in North Carolina have received loans for the production of mica, as have two in Georgia, two in New Hampshire, one in Maine (for beryl) and seven in South Dakota for mica, beryl, and for columbium and tantalum. The DMPA established purchasing depots in North Carolina, New Hampshire and at Custer, S. D. The program calls for buying 25,000 tons. At first the agency was buying only "ruby" mica, but since domestic producers have had so little of that grade to offer, the Munitions Board has agreed to determine whether other grades will be acceptable. Purchase depots have been authorized to accept up to 25 tons per year of beryl ore from individual producers. Ore must contain not less than 8 percent BeO . A flat price of 20 cents a lb has been set.

Bulk of tantalum ore has come from the Black Hills, or has been imported. Tantalum metal is important in the manufacture of jet engines. Southwest Africa has become an important source of beryl.

MONAZITE AND BASTNASITE—At one time, India and Brazil thought they had all of the monazite available in the world. Plants to produce rare earth chemicals were started in each of these countries. Recently, very widespread occurrences of monazite in stream placers in Idaho were discovered, and three dredging operations are now being carried on. About a year ago a large rock deposit was discovered in South Africa, and was acquired by the Anglo American Mining Co. with which Lindsay Light and Chemical Co., the largest American producer of rare earth chemicals, has made a contract. Both the U. S. Bureau of Mines and the U. S. Geological Survey have field parties looking in the Southeast for additional deposits of monazite.

Bastnasite, discovered a few years ago, does not contain any thorium, but is essentially a cerium compound. The U. S. Geological Survey carried on extensive mapping of the area near Mountain Pass, Calif., on the east side of the Mohave desert, and has just issued a geological map of the area. The original deposit there called "The Birthday" did not prove to be very large, but the geological mapping uncovered another large deposit called the "Sulphide Queen." This covers 20 acres of "barite-carbonate" rock containing high grade bodies with up to 40 percent rare earths. The Molybdenum Corp. of America took over the Sulphide Queen Mining Co. which owned the ground, and has since acquired additional claims covering a continuous vein system extending three mi to the south. The whole deposit is estimated to carry one

the commercial production of boron nitride, which is a superfine, crystalline white powder of extreme refractoriness and is apparently a non-conductor of electricity at any temperature. Applications are varied: as an anti-sticking agent in contact with molten glass or metal, as a heat resistant lubricant, as a thermal insulator in high temperature furnaces, as an experimental crucible material, as an electrical insulator, and as an addition to controlled semi-conductor compositions.

Heat resistant ceramic coatings for metals are commercially available, so that low cost metals can be used in high temperature applications, such as the exhaust systems of jet engines.

A new source of sillimanite has been developed in Assam, India. The producing company is Pilkington Brothers, Ltd. Another new source is in

The process involves treatment in attrition machines, primary flotation for the removal of iron concentrates; flotation of tailings from the first stage to produce quartz and the high alumina concentrates, and finally, de-watering of the three commercial products. The attrition machines are a new development by Western Knapp Engineering Co.

SLAG—The National Slag Association and the National Board of Underwriters had tests performed to determine the fire resisting properties of expanded slag used as an aggregate in concrete. The slags passed the tests, and the existing standards of the Underwriters' Laboratories have been amended to approve the use of slag for these purposes.

SODA ASH AND SODIUM SULPHATE—Late in 1952 the Westvaco Chemical Corp. started production of soda ash from trona deposits in Wyoming. A second shaft is being sunk 1500 ft to the deposit. Several other companies increased facilities for producing manufactured soda ash in existing plants. The rate of production was slightly lower than in 1951. Several companies have experimented with the use of anthracite coal in soda ash manufacture, instead of coke, with some advantage under certain local conditions.

The Sodium Sulfate Corp. of America is making plans for the construction of a \$900,000 plant at Alkabo, N. D.

Abroad, the Magadi Soda Co. leads the mineral production of Kenya Colony with its production of soda ash and salt.

SLATE—Operations during 1952 were at a much lower level than the year before due to Government restrictions on building and the uncertainty of what construction costs would be. Many projects that might have used roofing slate were either abandoned or postponed, or cheaper materials were substituted in order to cut construction costs.

The use of slate for flagstones has increased during the past year and this has helped to take up the slack caused by the decline in the use of slate for roofing.

Freight rates have continued to climb along with the other costs that have combined to put slate into the luxury class, although a favorable freight rate to west coast points has resulted in some increase in shipments of flagstone to that area.

The manufacture of slate granules has continued at a normal rate.

Prospects for the coming year are questionable and will depend largely on developments in the construction industry.

TALC—The talc industry in the west is going along on the same basis as before except that there is a greater demand for steatite talc.



Use of slate for roofing declined but production of flagstone increased

billion lb of rare earths, and if it continues to depths, may be much larger. The recovery process involves depressing the rare earths, and floating the barite, then activating and floating the rare earths.

Another bastnasite deposit in New Mexico belonging to the Corona Corp. is being investigated by the Lindsay Light and Chemical Co. which has taken a 40 percent interest in the Corona Co.

QUARTZ CRYSTAL—A deposit of usable quartz crystals has been discovered on the Goshute Indian Reservation in Nevada.

REFRACTORIES AND ELECTRICAL INSULATING MATERIALS—The use of wollastonite, calcium silicate, was announced a year ago, for low dielectric loss insulators, and in wall tile bodies. ZrO_2 is finding important applications for refractories exposed to temperatures of 3000° F. Titanate ceramics, because of their high dielectric constant are used as capacitors, while polarized titanates which exhibit piezo-electric properties are used as vibrating elements in microphones, acoustic transducers and in supersonic vibrators. The Norton Co. of Worcester, Mass., announced

Kenya, where Kenya Kyanite and East Africa Minerals Ltd. are producing the refractory. A potential source of both sillimanite and kyanite is in the titaniferous sand deposits of Florida.

SANDS AND SILICA—A new silica product was developed by the Standard Silica Co. of Ottawa, Ill. This is a uniformly graded sand used to rejuvenate the flow in depleted oil bearing horizons. The sand is transported into the well with a lubricant of jellied gasoline. Another unusual and unexpected use for silica sand is in greases. This has been announced by the National Research Council of Canada. The silica is prepared as a light, fluffy product. Five percent of it mixed with a thin lubricating oil makes a heavy grease, with a clear light yellow color. It is stable at high temperatures and has a long life.

Another Canadian development during the year was the establishment of a new processing plant at Montreal by the Dominion Silica Corp. In California, Del Monte Properties Co. has put into operation in 1952 a flotation plant at Pebble Beach, Monterey County, to produce standard glass sand, and high alumina concentrates.

Chief developments are the opening up of large deposits of quite pure talc in Montana near Dillon and Ennis. Tri-State Minerals is active in the Dillon area, while Sierra is active in the Ennis region.

Southern California Minerals added a new Raymond mill and equipment to its plant in Los Angeles.

Sierra built an entirely new talc plant at Grand Island, Nebr. All of the talc mines on the Pacific Coast are operating at capacity and have been all year.

Prospects for 1953 are about the same as for 1952, except there should be more emphasis on fine particle size talcs.

TITANIUM—Titanium was much in the news during 1952, but most of the items dealt with the production of titanium metal which is a metallurgical rather than an Industrial Minerals problem. Undoubtedly, however, much of the rosy future for the "wonder" metal has been the stimulant for activity on the part of holders of ilmenite deposits. The major development of the year on the raw material side was the completion of four of the five furnaces scheduled to be built at Sorel, Quebec, for the manufacture of a rich titanium slag by the Quebec Iron and Titanium Corp. Ore is mined at the deposit north of Havre St. Pierre on a scale of 2800 tpd, hauled over the recently constructed 27-mi railroad to the port, and shipped 550 mi up the St. Lawrence. There the ore is smelted to the slag and iron ore. Difficulties of removing sulfur from the iron has been overcome by injecting nitrogen into the molten iron. The problem of marketing the slag to east coast pigment manufacturers at a price competitive with other sources of titanium ores was given a boost when an ocean freight rate of \$3 per ton to East Coast ports was established. The slag analyzes 71.9 percent TiO_2 which compares with about 60 percent for Indian ilmenite, 63 percent for Floridian, and about 45 percent for the Adirondack "rock ore." (The latter competes because of its low content of chromium and ferric iron.) However the slag is high in magnesia and alumina, and cannot be readily chlorinated for manufacture of $TiCl_4$, the starting material for titanium metal.

In spite of the ready availability of this slag, and of ilmenites of high grade from India and Florida, several deposits of ilmenite of the 52 percent quality or lower were brought into production, or were under development. In Quebec, the Terrebonne Titanium Co. drilled a property near Ste. Marguerite, north of Montreal, and has developed a flotation process. Also in Canada a deposit near Ste. Agathe in the same general area is being developed by Arnora Sulphur Mining Co. The firm of Burnup and

Sims, Inc. of West Palm Beach, Fla., which formerly was part owner of "RIZ" (rutile-ilmenite-zircon) which operated at Melbourne, Fla., has taken a 10-yr lease on the long known deposit on the South shore of Alabar Sound in North Carolina. Substantial quantities of ilmenite of about 48 percent grade are accumulating as a by-product of the monazite dredging near Boise, Idaho. The gravel deposits at Hoodoo Creek in Idaho, and in Teton and also in Broadwater Counties, Mont., were investigated in 1952 by the USBM.

A new process to treat the large deposit of titaniferous magnetite near Laramie, Wyo., has been announced. The process involves roasting the ore with soda ash at $950^\circ C.$, and then leaching it with water. Other metallurgical processes to treat titaniferous magnetites have been in the news. A. S. Hitania, a Norwegian company, plans to construct a plant at Sokndal to produce iron from a titaniferous ore. The Japanese have been at work on various stages of titanium manufacture. Ishiwara, Sanyo KK has signed a contract with the Glidden Paint Co. to produce titanium oxide pigment at Yokkaichi by May, 1953. Ilmenite will come from the Anan mine in Sumatra, as a by-product of a tin concentrator.

A big rock deposit of titaniferous magnetite is being developed in Finland at Otanmaki. The concentrator will produce a magnetite analyzing 67 percent Fe and an ilmenite with 45 to 46 percent TiO_2 . The capacity of the concentrator will be 500,000 tons of ore per year, producing 175,000 tons of iron concentrates and 75,000 to 100,000 tons of ilmenite.

The deposit of sand ilmenite in Senegal, that was worked a number of years ago, has been reopened. The Ceylon Government has been trying to interest various companies in developing their deposits at Polmoddai on the East Coast of the island. The Ceylon ilmenite is of intermediate quality, but the deposit carries substantial amounts of rutile, a titanium mineral that is in short supply, and preferred for $TiCl_4$ manufacture.

A deposit on the east coast of South Africa has been under development and in West Africa, both in the Cameroons and in Dahomey, there has been a small production of rutile. Rather extravagant claims are being made by an Australian producer called "New South Wales Rutile Mining Co. Pty. Ltd." which has taken over the deposits and plant of the Tweed Rutile Syndicate, at Tweed Heads (on the boundary between New South Wales and Queensland). It is announced that the company will produce 100 tpd of rutile. Also in Anchaba, the Zinc Corp. has been operating its pilot plant on Stradbroke Island, off Brisbane Harbor.

In Florida, the National Lead Co. has acquired additional land around its Jacksonville property, and presumably has expanded its reserves substantially. At the Trail Ridge plant of the du Pont Co., near Starke, Fla., facilities have been installed to concentrate the mineral staurolite, which is abundant in the sand, and is shipping the concentrate to a cement plant near St. Augustine where it is used as the aluminous ingredient of cement. Humphreys Gold Corp. operates as the prime contractor for both National Lead and for du Pont at the two Florida properties.

The National Lead Co. has acquired the titanium oxide plant at Leverkusen, Germany, in which it formerly had only a 50 percent interest. The ore will continue to come from the company's property in southern Norway.

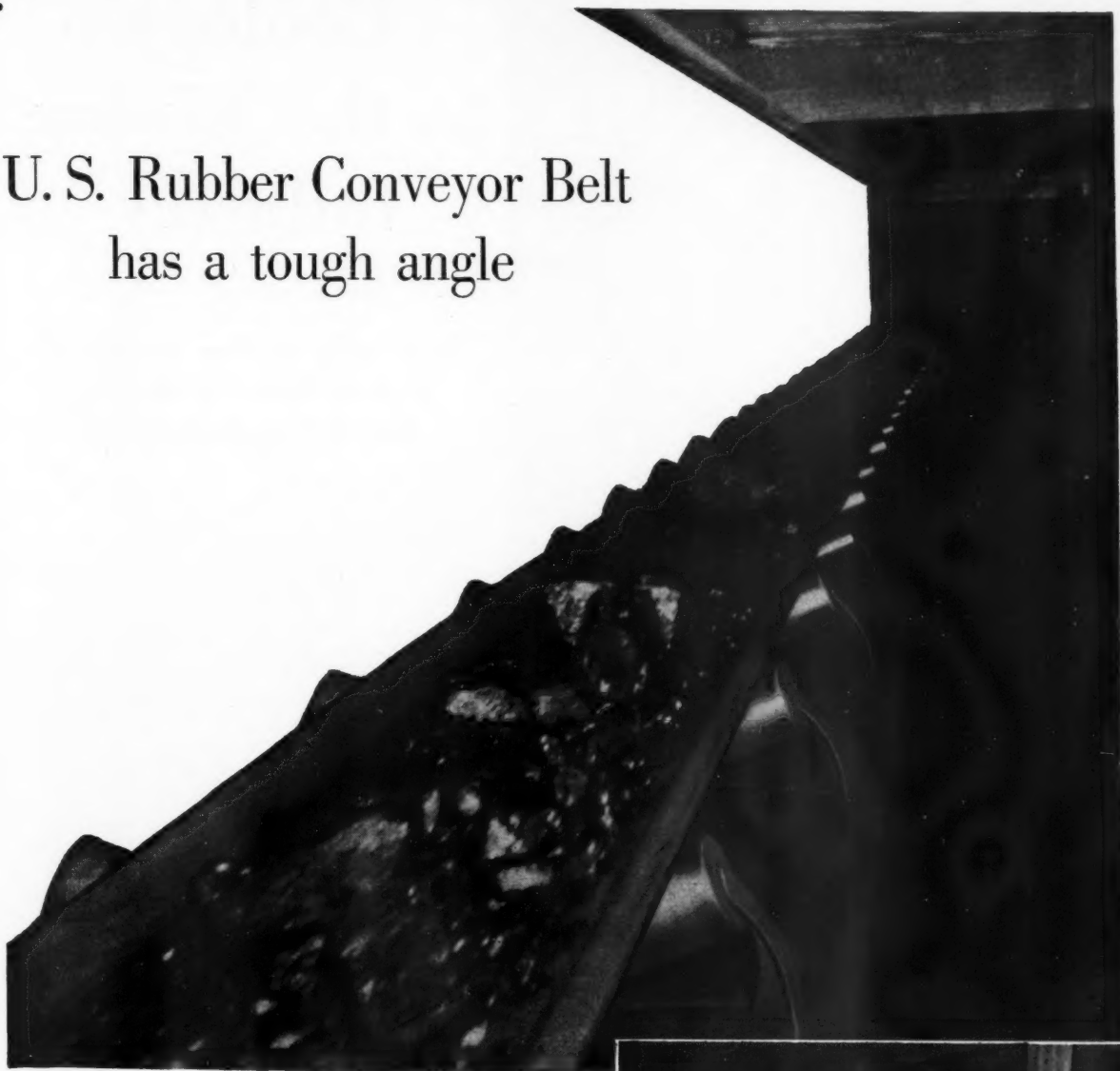
The State of Travancore, India, which was formerly the principal producer of ilmenite ores, has been having a great deal of what are presumably political troubles, and is unable to produce half as much ilmenite as it did formerly. It has been announced that all of the four operations will now be combined under the direction of the management of Hopkin and Williams Travancore Ltd. a firm which, up until now, has escaped nationalization.

VERMICULITE—Mineral, which was used formerly only as a loose fill insulation, and as a light aggregate ingredient, now has some other important uses, including lightweight fireproofing, soil conditioner, poultry litter, an additive in wall board, paints, asphalt, etc. A new processing plant in Milwaukee went into production recently. The industry has grown up to the point where it now has an "Institute" which met in Tucson in April. The Zonolite Co. has established a research laboratory at Evanston, Ill. The same company which has an operation at Travellers Rest, S. C., has opened up a processing and distributing plant at High Point, N. C. Also in North Carolina, the American Vermiculite Co. is building a processing plant at Woodruff, obtaining its raw material from Enoree.

ZIRCON—Adequate quantities of this mineral are available so long as ilmenite and rutile are mined from beach and river sands in which it is abundant. In fact, at both Florida ilmenite operations there are large piles of "dry-mill" tailings which contain zircon, and could be re-fed through the zircon recovery plants, if the demand justified. The largest industrial mineral use for zircon is as a foundry sand, although much of it goes into refractories.

Important developments of zirconium in the metal field belong among Metallurgical Problems, rather than those of Industrial Minerals.

U. S. Rubber Conveyor Belt has a tough angle



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Most important principle of mining geology is sound geologic mapping above and below ground

Geology in the Mining Industry

Fostered by the "New Feeling" In
National Affairs, Exploration
Activity Is on the Increase

By RICHARD M. FOOSE

Professor of Geology
Franklin and Marshall College
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PROOF of the pudding is in the eating! Time-worn as this cliché is, it has a hard core of truth for the mining industries. The significant thing is that a lot of "pudding" is being eaten—or about to be—by mining companies who have applied sound geologic principles to their programs of exploration and development. This includes the application of many of the new techniques and tools that have been used by the mining geologist for the first time during the last five to ten years.

Let's take a look at some of these techniques and tools and how they have been used during 1952.

Geochemical Prospecting

During the past year, probably the outstanding advance in geochemical prospecting has been the acceptance of soil sampling as a recognized exploration tool by many mining companies. The three metals most commonly analyzed at the present time are copper, lead and zinc. The analytical methods used are generally those rapid chemical field methods developed by the United States Geological Survey or adaptations of them.

The USGS has continued its research on the development of new and improved rapid and analytical field methods. A compilation of published field methods used in geochemical prospecting by the Geological Survey was released as Circular 161. Also released were new methods for the determination of cobalt and antimony in soils and rocks. Soon to be released

are new methods for cobalt in water and arsenic in soils. One of the most interesting recent publications on exploration geology is the USGS translation from the Russian of "Geochemical and Mineralogical Methods of Prospecting for Mineral Deposits."

Lack of complete information makes it hard to assess the full measure of success mining companies are having with this new exploration tool. However, by piecing together scattered bits of information it is certain that geochemical methods of prospecting have played an important part in the recent discovery of several large ore bodies.

For example, tests carried on by the New Park Mining Co. have convinced the operators that for their area at least geochemical methods of ore-search are most useful in indicating where there is no chance for ore—areas having a normal P.P.M. (Parts Per Million) background of a metal. High P.P.M. determinations have not led them to any ore discoveries, but seem to indicate only the former presence of mineralization solutions, usually along contact zones, faults, and limonite beds. This situation is of course complicated by the fact that in the area studied most, if not all, the ore bodies give evidence of their highest commercial deposition being several hundred and possibly more than a thousand feet under the present surface.

Use of soil sampling (geochemistry) techniques have been used during the past year by the Hecla Mining Co., Wallace, Idaho, by American Smelt-

ing and Refining Co., the Coronada Mining Co., the New Jersey Zinc Co. in many parts of the country, and by other companies, all with some degree of success. There is little doubt that this valuable new tool of the mining geologist is passing the threshold of general acceptance and will be even more widely used in the coming year.

It is reported that biogeochemistry is being used by several mining companies as a supplementary technique in the search for new mineralized zones in New Mexico, the northwestern states, and in western Canada.

Country Rock Alteration

It is known that magmatic activity is responsible for the origin of many important ore deposits and that it makes its presence known by alteration of a large amount of rock. Such large alteration aureoles depend on the amount and nature of the hydrothermal solutions, the porosity, permeability, and composition of the rocks, and the pattern and degree of fracturing of the rocks. It has been possible in many instances to use such studies for the critical delineation and location of ore deposits. Foremost among these studies is the work by Professor Kerr, of Columbia University, and that of some of his students in the Marysvale district of Utah. Undoubtedly, more work of this kind will be done with profit during the coming year by individual mining companies.

Fundamentally similar to the alteration studies are investigations of the gossans overlying ore deposits. These are the weathered, leached, oxidized, or otherwise altered "caps" of the ore deposits. Although much of this work is in the initial stage, certain tentative conclusions which might be drawn and point toward another useful tool that may be widely used. It appears that gossans in the wet eastern states are more widely disseminated for zinc ores than in the drier western states. Furthermore, eastern gossans are often partly or completely obliterated by a heavy mass of residual soil. Color may prove to be a critical factor in the search for lead and zinc. Certain elements, such as molybdenum, may be valuable as trace elements in the search for lead. Degree of porosity is a possible tool, especially where a boxwork is formed, and this may be indicative of the nature of the ancestral sulphide. Research in this potentially fruitful field has been led

fraction seismic data are used to locate and outline areas where shallow coals have been cut out by pre-Pleistocene erosion and are now covered with 10 to 100 ft of Quaternary deposits. Seismic readings are taken with truck-borne equipment every quarter of a mile along lines that are one mile apart. The data obtained show depth to bedrock. The altitude of bedrock is then determined and compared with the projected altitude of the coal. If the projected elevation of the coal is higher than that of the top of bedrock, the coal is absent; if the altitude of the coal is lower than that of bedrock, then the cut-out has not removed the coal.

During the past year there were also modifications and new adaptations of old methods, and some brand new techniques as well.

As an adaptation of the work done with the aerial magnetometer, a valuable new tool is the airborne scintillometer and geiger counter which are

phone service wires overhead. The reconnaissance survey around Galena has located some shallow pyrite and galena deposits and perhaps one sphalerite deposit associated with metallic pyrite and galena. A limiting factor around Galena is the apparent inability of a radio field to penetrate the Maquoketa shale which in places overlies the ore-bearing limestones and dolomites.

Photogeology

A major tool gaining wider use by mining companies today is photogeology. Pioneered by the oil industries a decade ago, many mining companies have now completely accepted this valuable adjunct to ordinary methods of field investigations. In large areas where it is necessary to delineate special features the use of aerial photographs has special value, not only for the greater speed with which the work can be done but also afford to do without.



Geologic inference and geophysical techniques established location of Grace mine of Bethlehem Steel Co.

by Professor Charles Behre and Mr. W. C. Kelly of Columbia University, and others.

Geophysical Techniques

Established geophysical techniques were widely used in 1952 not only for exploration but for development work as well.

Use of the aerial magnetometer was probably greater in 1952 than in any previous year and the value of this instrument in exploration for many kinds of ore needs no further elaboration. As just one example of the 1952 work, an aerial magnetometer map showing anomalies in a region of titaniferous magnetite deposits in a part of the Wichita Mountains of Oklahoma was placed on open file by the Geophysical Branch of the USGS. As a result, a diamond drill program will be started this year by private enterprise to determine the size and character of the deposits.

An old technique is being used for a new purpose by the Coal Section of the Indiana Geological Survey. Re-

being used by the Atomic Energy Commission, the USGS, and others in the search for radioactive minerals.

The importance of iron ore in Nevada has increased the use of the magnetometer and has resulted in some experimentation. The United Geophysical Corp. has experimented with a truck-mounted continuous recording electronic magnetometer. The distinct advantage is that the continuous record will indicate ore bodies that might be missed by widely spaced station readings of the conventional magnetometer.

A new technique of geophysics, *electromagnetic surveying at radio frequencies*, has been applied experimentally in the Galena, Ill., zinc and lead district. This new geophysical approach involves measurement of field intensity and field polarization in air at the earth's surface. Anomalous intensity and polarization reflect the influence of sub-surface conductive ore, depending upon conductivity and dielectric constant of country rock, and the complicating influence of cultural field hazards such as electric and tele-

usually the greater accuracy with which it is done. Not replacing the need for field mapping, use of stereo-paired black and white photographs have nevertheless effected tremendous economy of time and money in carrying out programs of exploration and development by companies engaged in the production of metals, non-metals, and coal.

As a newcomer to the field of photogeology during 1952, colored aerial photographs assumed considerable importance, especially in connection with exploration by the copper companies in New Mexico, Arizona, and Nevada. The great value of colored aerial photographs lies in the fact that the contrasting colors may immediately detect and emphasize basic differences not only in the topography but in the rock composition and degree of alteration in mineralized areas. The use of colored aerial photographs in conjunction with stereo examination of ordinary black and white aerial photographs comprises a tool which mining companies engaged in exploration of large areas can ill-

Organized Research

Although not a tool or technique in the ordinary sense of the word, an outstanding development in the field of mining and geology has been the method of organized research. Epitomizing this development on a large scale in 1952 was the organization of Kennecott Copper Corp. into regional groups for exploration and development work throughout the United States. Each group is staffed with experts familiar with the geologic environment of the region. In addition, Kennecott has established a new research center on the campus of the University of Utah in Salt Lake City similar in organization to the many research and development laboratories that were established by the oil companies during the past decade. Through such organization of knowledge and effort many of the new techniques described above will be used in a more exhaustive and intelligent manner than ever before. Although many of the smaller mining companies, and possibly some of the larger ones, continue to rely on "doing it the old way," there is little question that we are on the threshold of a new era in which the value of mining geology and its application to mining industries will be appreciated as it has never been before.

New Mining Operations During 1952

As tangible evidence of the success of all these new techniques being employed by the mining geologist and of the thorough use of the basic principles of mining geology, of which the *primary one is sound geologic mapping above and below ground*, there are many new mining developments in this country and in many others throughout the world. A few of these should be mentioned.

Nineteen fifty two was the year for development of iron mines everywhere. In Nevada alone, eight new open pit iron mines have been developed. These will produce 150,000 long tons of high-grade ore monthly. Most of the ore bodies are tabular lenses of magnetic and hematite associated with igneous and metamorphic rocks. Other new iron ore deposits have been developed in Texas, California, and Utah. In nearly every case development may be traced to the sound principles of exploration or mapping through mining geology.

Bethlehem Steel Co. is pushing their first shaft below the 700-ft level toward a large new magnetite ore body, outlined several years ago following a detailed survey with the aerial magnetometer. When the ore body is tapped at about the 1800-ft level, one of the largest block-caving mining operations in the world will be under way.

The big development in the Minnesota iron mining country is the rapid progress in taconite mining and concentration. In this same country teamwork by the USGS is developing basic geologic maps of all of the iron ranges on a scale and with an accuracy not achieved heretofore.

An interesting new development near Duluth, Minn., on a copper-nickel deposit in the gabbrolopolith is approaching the development stage. The International Nickel Co. has obtained the rights to explore a stretch of several miles along the known sulphide bearing belt.

In the State of Washington the Van Stone Mine of the American Smelting and Refining Co. near North-



Mining geology guides both the drift and the drill at Butte

port opened in October 1952. This deposit consisting of two main mineralized zones of galena and sphalerite will be mined by open pit methods. More than 1000 tpd will be produced from this property which was developed solely through a careful program of geologic mapping and exploration. At the present time A.S. and R. is exploring other ground in the vicinity, making use of magnetometer, geochemical techniques, and geologic mapping.

Spurred by a critical shortage of cobalt for wartime needs, the Calera Mining Co. has brought the Blackbird Mine in northern Idaho into rapid production. The ore is being shipped to the large new refinery near Garfield, Utah, which can handle 3,000,000 lb of cobalt a year.

Significant discoveries at the New Park Mine near Park City, Utah, give hope for a new lease on life for this outstanding mining center. Investigations have shown the limestone is replaced widely by halloysite, which points to the possibility of associated sulphides.

Of continuing interest is the development of uranium deposits in many

parts of the West. New prospects have been opened in New Mexico, Colorado, and Utah. Discovery and development of the uranium deposits at Marysville are of major significance because the source of mineralization is connected with tertiary intrusives into igneous flows as contrasted with the numerous uranium deposits of the Colorado Plateau in which carnotite is disseminated throughout sandstone.

New exploration and mining activity in both Oregon and California have resulted from the Government chromite purchasing program. As a direct result more than twenty small concentrating mills have been built in the two states to handle chromite being produced from many sources. Sound geologic principles have been applied in the search for chromite in both states.

Arizona has seen a terrific flurry of new copper developments, all of them paced by mining geology and its tools of geophysics and geochemistry. American Smelting and Refining Co. is opening the Silver Bell copper property about fifty miles from Tucson. Phelps Dodge Corp. is placing the Lavender Pit into production at Bisbee. Miami Copper Co. is placing a new mine into production in the Globe District. Magma Copper Co. is actively engaged in preparing the large San Manuel deposit for production about fifty miles from Tucson. The Pima Mining Co. is developing a very good new copper deposit found during 1952 by the application of geophysical methods.

The St. Joseph Lead Co. has developed a new ore body northwest of Potosi in Washington County more than twenty miles from the original lead belt area. The new shaft has bottomed near 1000 ft, which is more than twice the depth of the other mines.

Not all the developments are concerned with the metals. In the field of industrial minerals mining geology has also played a highly important roll. Careful geologic mapping following the identification of the rare-earth bearing mineral, bastnasite, has resulted in the development of a large property by Molybdenum Corp. of America in California. The large new spodumene mine of the Foote Mineral Co. near Kings Mountain, N. C., is producing about 600 tons of concentrates a month. This will be the largest lithium producing operation in the country. In the sulphur industry new developments in the Louisiana delta country during 1952 indicate large new production of sulphur in the coming years. A new wollastonite property has been opened in New York State near Willsboro. A large new talc deposit has been developed near Eagle Flat, Tex. New feldspar reserves have been outlined in the old Spruce Pine District of North Car-

(Continued on page 102)



Domestic mine production is estimated at about 375,000 tons

Lead

Low Prices, Mounting Costs Forced Domestic Production Down As Imports Doubled

By FELIX E. WORMSER

Vice-President, St. Joseph Lead Co.

ABSORBED as we are in the day-to-day problems of selling metals, we are apt to overlook the deep seated forces, long term or trends, that have a bearing on the very existence of the mining industry. The year just closed was a striking example of this. Both national and international controls were in full bloom. Looking back to the beginning of the Korean incident in 1950, it appears that the nation's almost hysterical haste to rearm, as compared to European placidity, provided an excellent opportunity for control minded officials in our government and, to a lesser extent, abroad, to have a field day.

Domestically, the government seized upon the broad powers provided by the Defense Production Acts of 1950-51-52 to establish metal price controls. In some instances, as in copper, this led to the current chaos with a be-

wildering array of prices, and, in others such as in lead and zinc led to violent discrimination price-wise against American producers.

Super Plan Trimmed

In the international field, we witnessed in 1950 the birth, under the auspices of the State Department, of the International Materials Conference, which had its wings clipped by Congress last fall. Here was an agency with super plans not only to allocate world metals resources "according to need," but also ultimately to control production and use. It was the beginning of a planner's dream.

But perhaps even more exciting in the swift flow of events affecting the mining industry, was publication of the report of the President's Materials Policy Commission, which, although it contained many excellent

conclusions and observations of inestimable benefit to the mining industry, if adopted by Congress, offset this high note by suggestions that the industry might well look into international buffer stocks, commodity agreements and quotas as stabilizing instrumentalities. By building on a fear of prospective metal shortages, many of them subject to serious questioning, the implication was that we had better turn to the government to cure them.

The long term trend is apparently to introduce international controls, on the assumption that this will bring about stability. We have had several excellent examples in the last two years of what happens to our markets when our own and other governments attempt to stabilize them. Upon the outbreak of the Korean war, ceiling prices were established for lead and zinc so low that the effect was to divert necessary lead and zinc imports from our country to Europe, where the consumer and producer were unhampered by ceiling prices and able to bid freely for available supplies. At the same time, our government permitted American domestic consumers to pay higher prices for foreign lead and zinc than they were permitted to pay for the domestic product—discrimination that the mining industry rightfully resented. Subsequently this situation was corrected in lead, but it was never corrected in either zinc or copper, and today do-

mestic copper producers are being discriminated against in favor of foreign copper producers who serve the domestic market and receive higher prices for their output.

Britain Floods Market

In their eagerness to protect themselves against an anticipated lead shortage, the British government, through the Ministry of Supply, bought lead at prices well above the ceiling—from 20 to 25 cents per pound in 1951—and accumulated more metal than they could possibly use. In 1952, this situation was suddenly reversed. The British Government decided to sell its surplus stock and disposed of some 62,000 tons to the United States for military stockpiling. With the opening of the London Metal Exchange on

recorded for 1951, due primarily to mounting production costs and to the lower prices that prevailed in the market.

Lead imports needed to supplement the domestic mine supply doubled in volume and are estimated at nearly 600,000 tons, an all time high compared to 258,000 tons for 1951. Considering the emphasis placed nowadays on the desirability of our country facilitating trade by importing more raw materials, the record shows that the lead industry has done much more than its share. Imports have increased about sevenfold since before the war, to such an extent that the revenue from the low lead tariff becomes an important item to the government.

The reclamation of scrap is believed to have declined somewhat in 1952 and

foreign governments, whether intended or not. Whatever plan is developed should be automatic in operation and divorced from bureaucratic control of operations or profits.

One system suggested is the institution of a sliding scale import tax, in addition to the existing almost negligible tariff. Under this plan a base price of, say, 16 cents for lead would be established. Should the price decline, a tax of $\frac{1}{4}$ cent per lb would be applied to imports for each one cent decline in price. Above 16 cents, no tax would be imposed. Such a tax would permit domestic miners to continue operations much better than is possible today and prevent the intermittent shutdowns, which are so wasteful. The tariff on lead today amounts to only about seven percent, much lower, in fact, than our domestic excise taxes.

Currently much government and private energy is being directed to reducing our low tariff still further. One should say "misdirected," because the tariff is not a barrier. Other governmental measures, such as multiple exchange rates and quotas, are more important as trade restriction devices.

Lead miners would be well advised to give lead tariff adjustment early consideration. They operate in a heavily subsidized domestic economy, are taxed to help subsidize agriculture, shipping, housing, etc., and yet are in our first line of defense. They cannot continue to function properly and supply a regular volume of metal unless their current predicament is cleared up.



Wasteful intermittent shutdowns affect miner and operator alike

October 1, it pressed more metal on the market. Consequently, the London market was forced downward until it declined to approximately 10 cents per lb. This forced the U. S. market from 16 cents to 13½ cents, with disastrous impact on many western lead producers. As the year ended, the price of lead recovered and reached 14¼ cents. Our own government, also frightened, or convinced that there would be a lead shortage in December of 1952, established a new device, a civilian stockpile of lead, last summer by purchasing 27,000 tons to be sold in a civilian emergency. The anticipated shortage never occurred. Fortunately, this stockpile will be transferred to the permanent military stockpile.

Domestic Position In Brief

Domestic lead mine production probably amounted to 375,000 tons, a slight reduction from the 388,000 tons re-

is estimated at 439,000 tons compared to 482,000 tons in 1951. The total lead supply from mine production, imports and scrap is therefore estimated at 1,415,000 tons. Noteworthy is the fact that imports and scrap supplies of lead far outdistanced mine production in size.

Average consumption of lead for 1952 is estimated at 1,200,000 tons, roughly 100,000 tons per month. Any difference between supply and estimated consumption may be ascribed to the tonnage diverted to military stockpiling and to a slight increase in smelter stocks.

Sound Policy Needed

The industry is giving much thought these days as to a sound long range policy, which will assure its continued productivity—and even growth. This it must do in the face of forces with which it is unable to cope, namely, manipulation of the lead market by

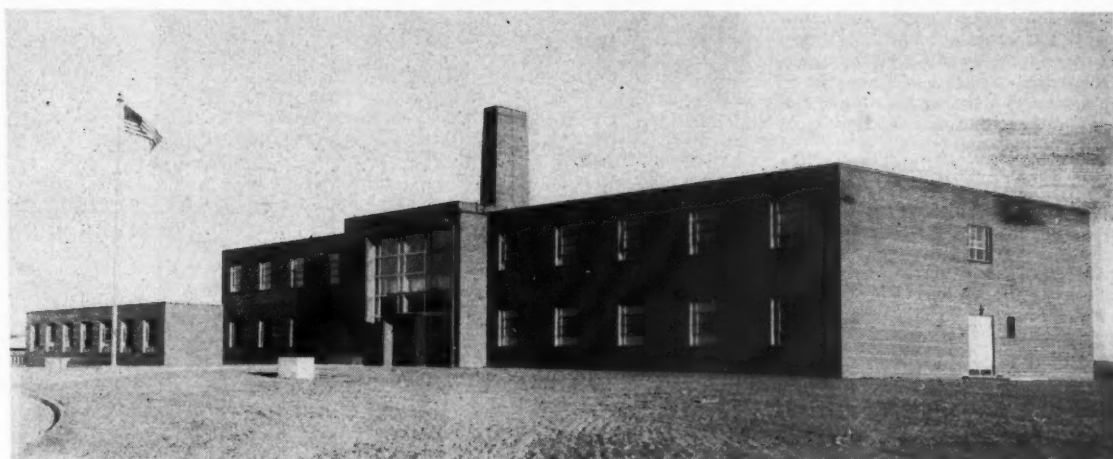
Geology

(Continued from page 100)

olina. New fluorspar deposits have been developed in Idaho and several other states, to say nothing of the large new deposits in Mexico. Other industrial minerals also have received the attention of the mining geologist with all his new techniques.

Looking Ahead

For several years past there has been a note of caution in the programs of exploration and development by the mining industry. This is true despite the many successful ventures by the industry during the post-war period. Adverse tax legislation and unfavorable political environment have fostered this caution. At the end of 1952 a "new feeling" seems to pervade the entire industry and it seems safe to predict—without too deep a look into the crystal ball—that the years immediately ahead will witness vastly increased activity in the field of exploration. The record of 1952 points the way for ever-increasing use of the know-how of the mining geologist.



Work in new Anthracite Research Laboratory at Schuylkill Haven, Pa., has wholehearted support of the industry

Anthracite in 1952

Research on Many Fronts Is Helping Solve Industry's Problems

By C. A. GARNER

Vice-President in Charge of Operations
Jeddo Highland Coal Co.

COMMERCIAL production of all sizes of anthracite during 1952 should approximate 37,200,000 tons. This decline of 2,100,000 tons or 5.4 percent from the tonnage mined during 1951 may be attributed largely to a falling off of foreign shipments. Nineteen fifty one was a year of abnormal exports. Then anthracite shipped to countries other than Canada amounted to 2,500,000 tons. Estimated exports for 1952 will not be more than 1,000,000 tons. Warm weather during the early months of 1952 was again prevalent. January, February and March registered an average of 8.2 percent above normal. However, the weather during the fall of the year was more favorable with temperatures nearer to normal.

Operating time, weighted, was 208.4 days, the same as during 1951. Total number of men gainfully employed in the industry at the end of 1952 was, however, under 60,000, which is a drop of about 5000 from the number employed during the previous year.

Competition Felt

Natural gas, L. P. (Liquified Petroleum) gas and oil continued to make inroads in the primary markets for the so-called domestic sizes. Fortunately, the market for buckwheat, rice, barley and smaller sizes remained

very strong. However, the effort to satisfy the demand for these junior sizes resulted in an overproduction of the larger sizes. The tonnage of pea and larger in storage at the end of 1952 is, therefore, approximately 500,000 tons greater than at the start of the year.

Public response to government officials and industry spokesmen to build up consumer inventories during the summer months was again disappointing. This reaction was not limited to the fuel industries and probably reflected a general apathy on the part of consumers toward all lines of business.

In an effort to retain present markets and to regain lost ones, new and aggressive sales policies were initiated during the year. It is too early to appraise the results of this change from traditional anthracite sales methods.

Labor Cost Up

Troubles of the industry were further intensified when a new contract with the United Mine Workers became effective on November 16. This contract called for a basic wage increase of \$1.66 per day and an increase in the payment to the Anthracite Health and Welfare Fund from 30 cents per ton to 50 cents per ton. The Office

of Price Stabilization granted an increase in the ceiling prices large enough to reimburse the operators for the added cost, providing all production was sold at the ceiling prices. Unfortunately, competitive conditions necessitated the sale of certain sizes at prices considerably below ceiling, with a consequent adverse effect on operating results.

Research Continues

During 1952 the Anthracite Institute laboratory continued its work in basic research, equipment development and testing, and in cooperative technical projects with the Pennsylvania State College. An expanded program on mining mechanization in cooperation with the Federal Research Laboratory at Schuylkill Haven, Pa., was started this year.

Since well over a million tons of carbon are used by industry for purposes other than fuel, a survey was made by the Institute and a report prepared of all of the industrial uses of carbon. Because anthracite is principally carbon, an evaluation of anthracite for the various markets was made with the possibility of extending its present use and substituting it for other raw materials. Basic studies have been made on the preparation and the use of anthracite for filtration in the industrial and chemical fields.

Gasification and the production of synthesis gas was closely followed and anthracite has been supplied for pilot plant tests in a pulverized fuel synthesis gas generator.

Fundamental research was conducted on new methods and new designs of domestic heating units which will burn large sizes of anthracite. The problem of designing equipment for converting oil and gas-fired equipment to anthracite firing was also investigated.

Work on tobacco curing with anthracite has continued and has shown that three systems will give top quality flue-cured tobacco. The work on crop drying is also continuing and the use of anthracite for this purpose is constantly increasing.

Institute representatives continued to assist dealers in planning exhibits of anthracite burning equipment in Home and Building shows. Among the larger shows in which anthracite equipment was displayed this year were the Philadelphia Home Show; Central Pennsylvania Builders Show, Harrisburg, Pa.; Buffalo Home and Flower Show; Detroit Builders Show; Boston Home Show, and the Canadian National Exposition, Toronto, Canada.

The Tenth Annual Anthracite Conference of Lehigh University featured many interesting papers on new and existing anthracite burning equipment. These Conferences provide the industry with the latest information on the mining, preparation and utilization of anthracite.

Move to Up Output Per Man

In previous reviews mention has been made of the serious decline in the output per man per day. Since 1941 contract workers have been given per diem increases in line with that paid to all other workers. The rates paid for contract items have not been changed. Therefore, prior to the 1952 contract the contract miner was paid 1941 rates for contract items performed and in addition received a fixed sum of \$7.83 per shift. This included travel time. Because of the fixed amount per shift, incentive to perform contract items was lessened. In many instances this resulted in increased production costs. The danger of continued daily increases to contract miners was recognized and under



Anthracite Institute worked unceasingly toward better utilization methods

the terms of the 1952 contract the contract miner received a 20 percent increase in the amount paid for contract items rather than a flat daily increase.

Expand USBM Laboratory

At the United States Bureau of Mines Anthracite Research Laboratory in Schuylkill Haven project work in anthracite mining, preparation, and utilization was expanded under the guidance of technical advisory industry groups, which meet at frequent intervals for the purpose of following progress in detail. Management, mine workers, the Pennsylvania State Department of Mines, the Anthracite Institute, Inc., and The Pennsylvania State College are represented. This work was greatly aided by the completion of a new wing and a garage warehouse. The wing, which is 52

by 53 ft, contains additional chemical laboratories, offices, design room, and a library. The garage-warehouse is a 60 by 160-ft structure which contains, in addition to garage and warehouse space, a coal-grinding room and woodworking shop.

Underground mining studies included (1) modern mining methods and testing of mining equipment for the increased production of anthracite and increased rate of gangway development; (2) testing of yielding steel supports in combination with back filling for better roof control; and (3) underground storage and distribution of compressed air. These projects were conducted at six collieries of our cooperating anthracite producing companies.

Induced Caving Tried

One of the mining-method projects was the induced-caving method in which the coal bed is tapped by driving rock holes on 30-ft centers from the rock gangway. Here the opening is driven 15 ft vertically in the coal and is expanded by 15 ft on each side of the rock hole, thus forming a long undercut face in the coal. The long face causes the caving of the coal which then runs by gravity through the rock holes to the mine cars. This mining method gives increased production, lower explosives cost, and greater safety to the men, as their exposure to falling rock and coal is practically eliminated.

Yielding steel supports (props) are under tests in a mine in the northern anthracite field, where two 300-ft pillar rows have been removed and the roof supported on these yielding props. After the coal in each pillar row was removed, the resulting pillar void was back filled with breaker refuse firmly packed to the roof by a belt-slinging packing machine. As packing progressed, the steel props were removed.



Use of yielding steel supports plus backfilling was tested as a means of roof control

Roof in these two pillar areas has subsided slowly and evenly with a maximum convergence of 3.43 in. Maximum roof load, measured by load cells, has been 59.5 tons. There have been no noticeable breaks in the immediate roof.

An underground compressed-air receiver was constructed by a cooperating coal company by mining the coal in a breast 130 ft by 56 ft by 4 ft. Receiver capacity is 36,800 cu ft, including the chute and near-by rock tunnel. The opening to the receiver is being sealed by constructing a concrete bulkhead in the rock gangway. This receiver will be filled with compressed-air during the low-peak-demand periods. Air will be stored with the expectation of improving the compressed-air supply at the entire colliery. This will also give stored air time to dry and cool, thus keeping water and lubricants from passing to air-operated machinery. Engineers of the cooperating company and the USBM have made an engineering study with Bureau air-measuring instruments of the compressed-air system as it is. A similar study will be made after the receiver has been put into use to ascertain the value of the receiver.

Other Studies Under Way

Preliminary work was carried on for the testing of a USBM-designed loading machine in a coal gangway, the study of the use of yielding roadway supports in a heavily caved ground area, the determination of the efficiencies of various type of packing materials, and the continuation of the use of dynamometer-cell type devices to measure mine-roof loads.

Preparation and utilization studies included (1) investigation of factors in the design and operation of launder screens in fine-coal cleaning; (2) problems in the production and use of anthracite producer gas in periodic kilns, with particular reference to combustion conditions in the kilns; (3) completion of laboratory and field studies of economic and technical feasibility of underfiring colliery boilers with producer gas made from anthracite bone coal, and (4) continuing investigation with the Anthracite Research Laboratory boiler room and heating plant.

Preliminary work in progress is aimed at establishing several projects covering objectives that are either of long-range or short-range character. These include: use of anthracite as a source of heat in crop drying and in frost prevention, and control in fruit growing and truck farming; studies on anthracite crushing and grinding; heavy-medium coal washing; use of larger-sized anthracite in gasification and metallurgical processes, and others.

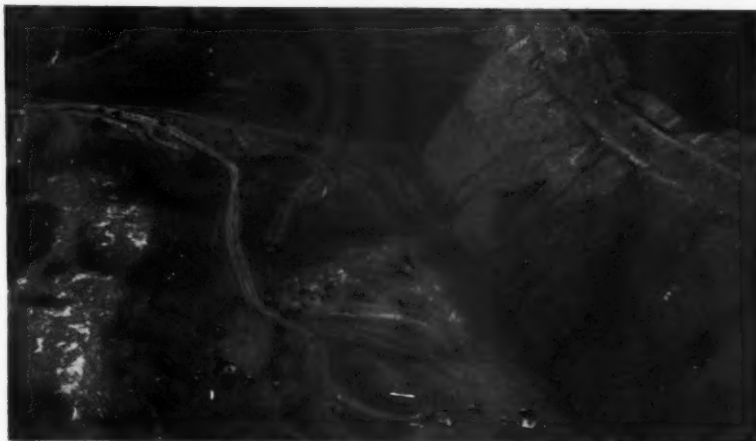
Private Research Projects

In addition to the projects being carried on in cooperation with the Anthracite Institute and USBM Research Laboratory at Schuylkill Haven, many operating companies have been doing a great deal of research on their own account. Of particular interest are the studies to improve mining methods. Successful conclusion of this research should result in an increased output per man

Continued demand for fine sizes has resulted in the installation of additional equipment to increase the production of these sizes. Several new plants have been built and others have been enlarged.

Stripping Active

Recovery of coal from strippings continued at a high rate. While the lower overburden to coal ratio strip-pings are rapidly becoming exhausted the use of larger and improved equip-

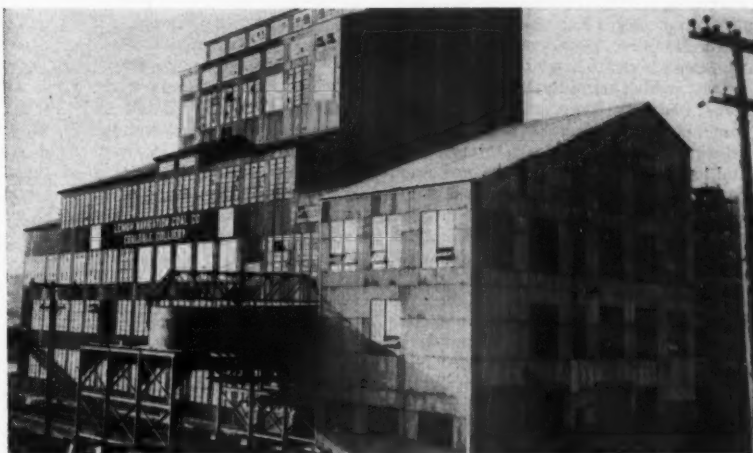


Recovery of anthracite from strippings continued at a high rate

ment is allowing the higher ratio areas to be economically stripped.

The use of mechanical mining equipment continues to grow. Probably the latest piece of such equipment to be installed was a Joy loading machine placed in operation by the Hudson Coal Co. A four-ft seam of fireclay had caved and practically closed all the openings in an area which had been mined and abandoned earlier. Use of the mechanical loader made possible the recovery of the pillars from this caved area.

In 1951 only one rotary drill was in use for drilling overburden. At the end of 1952 at least 20 were being used. During the year a Euclid dump truck capable of carrying 50 tons of material was demonstrated. A number of these trucks are now in use and on order. Shovel design has kept pace with the increased truck capacity. At least one shovel with an eight to nine cu yd dipper capacity is in use and several are on order.



Cleaning plants were expanded to treat fine coal



Feeling is growing that when prices fall below a certain level import duties on a sliding scale should be imposed to protect domestic mining industry

Some Aspects of the Zinc Industry in 1952

**Precipitous Price Drop, Reversal of Supply-Demand
Picture Will Make Year One Long Remembered**

By R. G. KENLY

Vice-President
The New Jersey Zinc Sales Co.

THE year just passed will long be remembered by the non-ferrous metals industry in general and the zinc industry in particular as one of the most upsetting and exasperating ones through which the industry has passed. The year began with abnormally high prices, which threatened the loss of some markets, heavy demands from consumers for slab zinc, which was under allocation by the National Production Authority, and warnings from government agencies that zinc would be in continuing short supply and that substitutes for it should be sought. The situation changed drastically with curtailed demand appearing in the second quarter, which was aggravated later by the steel strike and by prolonged strikes in the brass industry, coupled with rising stocks and declining prices. By the year's end the demand had picked up satisfactorily but the price had refused to budge upward.

In October, 1951, the price of Prime

Western slab zinc had been allowed by the Office of Price Stabilization to rise to 19.5 cents per lb. At that time slab zinc was being allocated by NPA and the demand was heavy. Yet there was an uneasy feeling on the part of the zinc industry that many of the demands made upon NPA for zinc were highly inflated and that the price was too high to be healthy. However, foreign smelters were avid for concentrates and the price of metal abroad had been bid up until it was over 30 cents per lb, making it extremely difficult for domestic smelters to obtain foreign concentrates for their smelting furnaces.

Picture Changed Abruptly

Domestic mines were running at a high rate and produced about 670,000 tons of recoverable zinc in 1951, the greatest annual production since 1944. Mine production was increased somewhat in the early part of 1952, and in May the zinc mines of this country

were producing at the rate of 750,000 tons of recoverable zinc annually. By this time the supply and demand picture had changed and on June 2, with the beginning of the steel strike, the price of zinc dropped two cents a lb to 17.5 cents. For the months of June and July zinc shipments were drastically curtailed and, as there was no curtailment of smelter production, metal stocks rose rapidly, increasing 30,000 tons in June and 37,000 tons in July.

The price continued to decline. On June 5 there was a drop to 16 cents and again on June 18 to 15 cents. With the settlement of the steel dispute on July 24, there was some hope that a price level of 15 cents might be maintained. But orders were slow coming in from the badly crippled galvanizing industry; there were strikes in the brass industry; and on August 6 the price tumbled to 13.5 cents. In September there was a recovery to 14.5 cents but the pressure of foreign zinc prices was too great and on October 27 the price sank to 12.5 cents, where it remained for the balance of the year.

Production Dropped

In June mine production began to come down to a lower level. Production for the first five months of the year had been at the rate of 60,600 tons per month of recoverable zinc, whereas for the months of July, August, September and October, the average had dropped to 50,000 tons.

On June 23 trading in zinc futures was resumed on the New York Commodity Exchange, having been suspended in July, 1951.

During 1951 and part of 1952, the British government was a heavy buyer of zinc in the world markets, with the aim of establishing a national stockpile. During the fall of 1952, there were rumors that most or all of this metal, estimated at between 150,000 and 200,000 tons, would be sold, and gloom descended on the market. The domestic price, which had been struggling to rise with increasing demand, gave up the attempt and there was speculation in the market place that the price would go lower. However, in December, the British Ministry of Materials announced an orderly plan for the disposal of some of the stock and retention of the balance, and a sigh of relief went up from the industry.

In the early part of the year the zinc industry awoke to the fact that certain agencies of the government were doing a Paul Revere act, spreading the alarm throughout the land that there just was not enough zinc, that there was not going to be enough zinc and the sooner the industry found substitutes the better. NPA, which had the job of allocating zinc to consumers,

smelter production abroad, and the handwriting on the wall became faintly legible—except in Washington, where midnight oil was burned working on an end-use control order and drawing up plans to divert to industry some metal intended for the military stockpile. By March it was apparent that the big buying rush of metals, which had begun during 1950, was definitely losing momentum and in April the Zinc Producers Industry Advisory Committee of NPA stoutly maintained that there would be a surplus of zinc by the end of the year and urged the revocation of NPA orders controlling zinc. Finally, in May, NPA amended Zinc Order M-9 to remove allocations, and the fireworks were over. In justice to the hard working members of the Tin, Lead and Zinc Division of NPA, it should be stated that the allocation of slab zinc during the period of controls was handled very efficiently and effectively.

Ever Normal Granary Idea

It was some time during the spring of the year that the idea of a civilian stockpile of metals was proposed by certain government officials, to be created alongside the military stockpile. The idea was for the government to

functioning of the law of supply and demand.

"Paley" Report and Zinc

In the early summer, there was issued the famous report of the President's Materials Policy Commission, otherwise known as "The Paley Report." This five-volume masterpiece immediately became required reading and served to divert the minds of many from the hot, dry summer. The report provoked all kinds of reactions, many of which were violent.

Of particular interest to the zinc industry are the forecasts made in the report. In respect to zinc, the report indicates that the domestic demand for zinc will increase about 40 percent in the next 25 years. To satisfy this increasing demand, the United States must turn more and more to the use of foreign concentrates and zinc metal, because it is not believed that the domestic zinc mine production will exceed 700,000 tons per year, little more than the current level of output. If such is the case, United States imports may be expected to double by 1975 to an annual amount of 800,000 tons.

Recognizing that percentage depletion is a forceful incentive for exploration and mine development, the recommendation is made in the report that it be retained but that the present rate of 15 percent for metal mines be raised no higher. As for the permitted deduction for tax purposes of costs of exploration and mine development, it is recommended that the present limitations on these costs, as now applicable to metal mines, be removed.

Tariff Controversy Hot

The import duty on zinc concentrates and metal hit the headlines during the year. These duties, set by the Tariff Act of 1930 at 1.50 cents per lb of zinc content of the ore and at 1.75 cents per lb of metal, had been successively whittled down by the Canadian Agreement of 1939, the Geneva Agreement of 1948, and finally by the Torquay Agreement of 1951 to 0.60 cents and 0.70 cents per lb, respectively. During the latter part of 1951 and the early part of 1952, these lowered duties did not concern the domestic miner. The price of metal and of concentrates was high, the demand exceeded the supply, and there was little inducement for imports because the domestic price set by OPS was lower than the prices obtaining abroad. As a matter of fact, the domestic smelters were having difficulty in obtaining sufficient foreign concentrates.

To offer some inducement for imports, President Truman signed bill H. R. 5448, effective February 12, 1952, which suspended the duty on zinc concentrates and metal until

(Continued from page 110)



U. S. needs healthy mining industry able to plow back profits into never ending search for new orebodies

under pressure from other agencies went so far as to seriously consider putting in a system of end-use controls, which would have denied the use of zinc for certain kinds of consumer goods. To this the industry objected strenuously, maintaining that already there were signs of easing in the situation and it was only a matter of time, and not a very long time at that, before the demand would slacken.

By mid-January the foreign markets began to lose their inflationary zip and foreign prices of copper, lead and zinc started to decline. Foreign mine production began to pull ahead of


buy for the civilian stockpile when the demand for metals was light and sell out of it to consumers when demand was heavy. There was nothing new about this idea—mankind has been intrigued by it since the days of the Pharaohs of Egypt and their "ever normal granary." The basic objection to it is that it puts the government in the metal business as a competitor to private industry and creates a situation which, as has been shown by experience, leads to price instability and confusion. This has always happened when man has devised schemes intended to circumvent the normal

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Through the cleaning plant passes an ever-increasing stream of coal from mine to customer

Coal Preparation Progress in 1952

Diversified Markets Demanded More Complex Flow-Sheets As Industry Faced Strong Competition From Other Fuels

By **ADRIAN C. DORENFELD**

Associate Professor of Mineral Engineering,
School of Mines, University of Alabama

COAL preparation methods have been influenced by the following factors:

- (1) Production of high-ash run-of-mine coal by mechanized mining methods;
- (2) severe competition from other fuels, making high grade coal a must;
- (3) increased value of coal due to ever mounting costs, necessitating higher recoveries, and
- (4) more stringent legislation concerning stream pollution.

The first factor has long been recognized, and during the past year coarse coal preparation has been widely extended, using conventional equipment, i.e., jigs, heavy-media, and Chance cones. Intermediate sizes, (about minus $\frac{3}{8}$ in. by $\frac{1}{16}$ in.) continue to be treated by wet concentrating tables.

A relatively new type of heavy-media process is now being introduced in this country, the Tromp Process. It is essentially a continuous thickener with the media (which settles with the heavy particles) hindering the settling

of the light (coal) mineral. The top of the media has a low viscosity, and therefore the rate of fall of heavy particles in this zone is rapid. The process is reported to be of high capacity.

Reduce Heavy-Media Losses

Loss of medium in heavy-media plants has been steadily whittled down. One plant reports a loss of only 0.1 lb/ton raw coal. Coal screening efficiency of fine sticky coal has been reported to be improved by use of electrically heated screens.

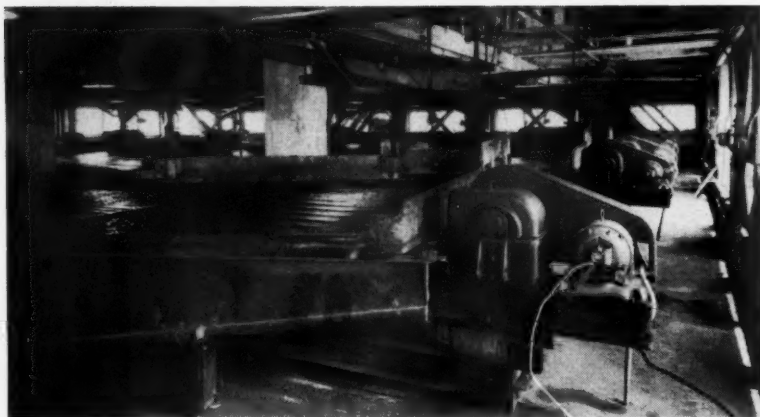
In connection with sink-float laboratory tests, the basis for gravity concentration plant design, a point usually overlooked, is the variation in moisture among the samples tested. Investigation of certain South African coals showed that anomalous results were due to variation in moisture content of the samples. The remedy was to keep all samples either under water or in moist air, thus standardizing

conditions. This point may be of importance in testing some of our own lower-rank coals.

Flow Sheets Are Complex

Severe competition and mounting mining costs have produced more complicated and varied flow-sheets in order to satisfy diverse markets, and at the same time get maximum recovery of coal. One example is the use of two heavy-media plants, each operated at a different density, with crushing of middling between treatment. It is reported that practically no coal is lost in the refuse. Another plant, using heavy-media-classifier type equipment, makes low-ash and high-ash coal simultaneously, for different markets. Another example is a plant serving small strip mines, which must produce a non-freezing dust-free coal, using a calcium chloride heavy liquid for separation. The plant can be easily dismantled and moved as the mines are depleted; the separation is accomplished by the salt solution; this same solution makes a non-freezing dust-free coal product. In general plants are increasingly being tailored to produce coal to meet local conditions, and to make the highest recovery from run-of-mine.

Increased costs of mining coal and stream pollution laws have focused a great deal of study on the recovery of fine coal. The variables of wet cyclone operation have been thoroughly investigated in this country, Canada, England, and Germany. Results reported show the wet cyclone is able to operate with wide changes in feed characteristics and tonnage rate. It is being used in two capacities: (1) as a separator of coal from refuse; (2) as a solids thickening mechanism to avoid



Increased mining costs necessitate higher recoveries

stream pollution. Flotation plants have been built in this country and in Europe for recovery of fine coal from run-of-mine and for the re-working of old silt basins. Research in coal flotation has been very active in Europe, judging from the available literature.

Fine Coal Recovery

Fine coal recovered by wet methods generally is a high moisture product. This problem has reportedly been solved by the application of the fluidized bed technique of drying in hot combustion gases. The fluidized proc-

ess for handling fine materials has been an outstanding success in the petroleum industry.

Recovery of fine coal in the dry state has long been proposed to avoid subsequent drying of concentrates. A new type vacuum jig has been marketed to separate relatively fine dry coal. Electrostatic separation of dry coal has been investigated in Australia, with promising results reported.

Finally, the over-all management of coal-preparation plants has been offered a very valuable tool—statistical quality control. It is discussed in detail, and applied to coal preparation, in an extensive article in the

January, 1952, issue of "Colliery Engineering." This technique has been extremely successful in a host of industries during the past 12 years and should prove of immense benefit in coal preparation as well.

Briefly, the method takes advantage of the fact that all repetitive tests, such as sampling coal, or obtaining a product with a given ash content, etc., fall into a pattern which is mathematically known as a normal curve. This pattern of results is obtained from the actual operating characteristics of the plant, coal, etc. Each and every sample must fall within this pattern. If it does not, then the evidence is that it comes from another pattern—i.e., the specific gravity of the media has changed or the viscosity, or the coal, etc. Thus, a definite line is drawn which indicates when to hunt for trouble in the plant. An extensive literature is now available on this subject.

Acknowledgments

A review article, of necessity, depends greatly on the technical literature. The author is indebted to the following journals: "Coal Age," "Mining Congress Journal," "Mines Magazine," "Mining Engineering," "Colliery Guardian," "Colliery Engineering," "Erdöl und Kohle," "Glückauf," "Journal of the Chemical, Metallurgical and Mining Society of South Africa," "Canadian Mining and Metallurgical Bulletin," and "Mechanization."

Zinc

(Continued from page 107)

March 31, 1953, or the end of the national emergency, whichever was earlier. However, the bill had a provision under which the President was to reimpose the duty when, for any calendar month, the average market price of slab zinc (Prime Western, f.o.b. East St. Louis) for that month was below 18 cents per lb. At the time the bill became a law, the price of zinc was 19.5 cents per lb. As the average price of Prime Western zinc for June was 15.74 cents, the tariff was reimposed on July 24.

As the price continued to drop during the summer and fall, the spectre of closed and flooded mines, rotting timbers and a disappearing labor force again arose to haunt the mining industry. Offerings of foreign zinc began to make their appearance at prices somewhat below the domestic price, and the tariff again became a controversial subject.

Fuel was added to the fire by the report of the President's Materials Policy Commission, referred to above. The Commission expressed the opinion that import duties can be harmful in setting up barriers against an important part of the materials supply

of the United States and recommended the elimination of the import duty on any industrial material in either crude or refined form when this country becomes substantially dependent on imports of the material. As the United States, since the beginning of World War II, has become dependent upon imports of zinc concentrates and metal totalling about 40 percent of consumption, it is apparent that the recommendation of the Commission would point pretty strongly at the duty on zinc.

Keep Industry Healthy

But the zinc miner, by and large, feels differently about it. His contention is that for security reasons, if for no other, the United States needs a healthy mining industry. What he means by this is an industry which is operating at a level high enough to produce sufficient profits to finance the never-ending search for ore bodies to replace those which, day by day, approach their final exhaustion and become nothing but so many holes in the ground. He is unable to understand why millions of dollars of the American taxpayers' money (including his own) should be sent abroad to develop mines to produce concentrates which invariably compete with his in

the domestic market when demand has slackened. He thinks that is the time when his industry needs some protection if it is to keep its health. When demand is good, and the domestic mines cannot produce enough concentrates to keep the smelters going, either in war or peace, the miner concedes that the best interests of the country are served by removing duties as an inducement to importation. But the feeling is growing that below a certain price level, which means below a certain demand level, the import duties should be on a sliding scale basis, increasing as the domestic price declines. It is likely that we shall see some attempts at legislation along these lines before long.

No record of the year would be complete without some reference to the activities of the Defense Procurement Administration and its agencies. One of these, the Defense Materials Procurement Agency, commonly referred to as DMPA, made contracts with certain zinc producers, both domestic and foreign, for the purpose of expanding production from mines and smelters. Anyone interested in details should obtain the pamphlet "Compilation Showing Progress and Status of the Defense Minerals Production Program," from the Government Printing Office in Washington.

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Smelting works in Northwest with 85,000-ton capacity started production in June

Aluminum

Industry Sets New Production Record in 1952 as Uses Increase

By DONALD M. WHITE

Secretary
The Aluminum Association

THE aluminum industry set a new production record in 1952, in spite of curtailments due to power shortages. On the basis of definite figures for the first eleven months, total production of primary aluminum in the United States during the year is estimated at 1,860,000,000 lb. This exceeds the 1,840,358,500 lb produced in 1943, peak year of World War II, and is about 11 percent over the 1951 production.

Production of electric power at hydroelectric plants serving primary aluminum smelters in both the Pacific Northwest and the South was curtailed during the last quarter by the worst drought in years. New capacity which went into operation as part of the industry's current expansion program, however, kept the production to high enough levels during the last three months of the year so that output was almost equal to the third-quarter total.

The industry's expansion program was hampered somewhat by the prolonged steel strike. Nevertheless, four new smelting plants went into operation during the year and additional equipment expanded the capacity of four existing plants.

Third round of aluminum expansion was announced by the National Production Authority. This is scheduled

to increase the industry's annual primary capacity by 400,000,000 lb. The new expansion already has brought a fifth producer into the picture and negotiations are under way with other prospective producers. One of the present producers has announced plans for a new smelting plant in Alaska which initially will have an annual capacity of 400,000,000 lb.

Step Up Mining Rate

To supply the additional alumina required for the new smelting capacity two bauxite refining plants are being built and two existing plants enlarged. One of the new plants began operations during 1952.

Bauxite mining is being stepped up as required to meet the new production demands. On the basis of definite figures for the first three quarters, the total new supply of bauxite available in the United States will approach 5,000,000 long tons and will probably exceed the postwar record for 1951 of 4,678,605 tons.

As in 1951, about two-thirds of the total bauxite requirement was imported and the remainder mined domestically. More than 95 percent of the domestic ore was mined in Arkansas, the remainder in Georgia and Alabama. Of the imported ore, about 90 percent came from Surinam, South

America. The remainder was divided between British Guiana, S. A.; the West Indies island of Jamaica, and Indonesia.

Two aluminum producers have been developing bauxite mines in Jamaica, and one began making regular shipments of ore to the United States in June. Shipments of Jamaican bauxite have increased steadily, reaching 11.5 percent of the imported ore in the third quarter. At the same time domestic production dropped to about 25 percent of the total supply during the third quarter, and imports from Indonesia ceased.

New Goals Set

In the fourth quarter of the year the Defense Production Administration announced an expansion goal for aluminum sheet and aluminum sheet and plate heat-treating facilities. The aim is to provide for additional rolling capacity for 684,000,000 lb of aluminum sheet annually by January 1955 and additional heat-treating capacity for 846,000,000 lb of sheet and plate annually by the same date.

To Build Better Aircraft

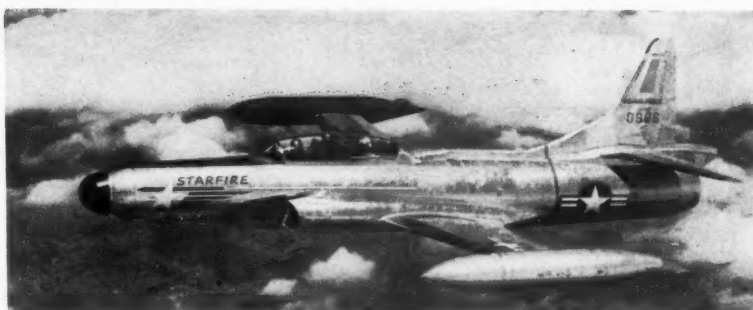
During the year the heavy press program of the U. S. Air Force moved ahead. This program will provide for a total of 17 die forging and extrusion presses of sizes considerably larger than any previously available in the United States. Cost of the entire program will approach \$400,000,000. In the words of one manufacturer, "it is providing the United States with a commanding position for the production of ever better aircraft."

The program includes nine die forging presses ranging in capacity from 8000 to 50,000 tons and eight extrusion presses ranging from 8000 to 20,000 tons. By permitting large individual aircraft components to be

produced, better and stronger high-speed military aircraft will result with reduced man-hour requirements in aircraft plants for fabrication and assembly. While it is too early to predict what presses of this magnitude may mean in civilian uses of aluminum, they undoubtedly will eventually expand the usefulness of the lightweight metal in nonaircraft applications.

Other Uses Increased

Although restrictions on the use of aluminum for civilian uses were in effect throughout the year, a number of developments indicated what may be expected when the restrictions are removed, such as extension of application of the metal as an electric conductor. Aluminum cable has proved itself on high-voltage transmission lines through years of satisfactory service. The lower cost of aluminum conductors, as compared with equivalent copper conductors, has spurred the development of techniques for successfully using the lightweight metal on lower-voltage circuits. As a result, the use of aluminum cable on distribution circuits of electric power systems and for building wire is increasing.



Aluminum helps build better, stronger, faster aircraft

Aluminum wire is also being used experimentally on telephone systems, and two of the largest turboelectric generators ever built will have aluminum field windings.

An increasing use of aluminum in the automotive field was another significant development during 1952. More operators of trucks and busses are finding that the lightweight and rust-free characteristics of aluminum soon defray its additional cost through reduced operating and maintenance expenses. Aluminum pistons have now been adopted for all U. S. passenger-

car engines. The increasing use of aluminum cylinder heads and other engine castings in lightweight military engines presage an increasing use of the lightweight metal in these units for civilian use. Development of the so-called "sandwich construction" in which several fairly simple castings are braced together to form complete engine components is one of the significant advances in this field. Aluminum automobile radiators may be found on cars of the future as a result of new alloys and fabricating methods developed during 1952.

Aluminum foil again became available for packaging civilian products during the latter part of the year. The introduction of foil-laminated drums for such products as oil, paint, and other liquid and semiliquid products is one of the industry's 1952 developments in this field. Aluminum foil pie plates, introduced before restrictions were imposed, are now being used in large quantities by bakeries and frozen-food processors.

Applied In Shipbuilding

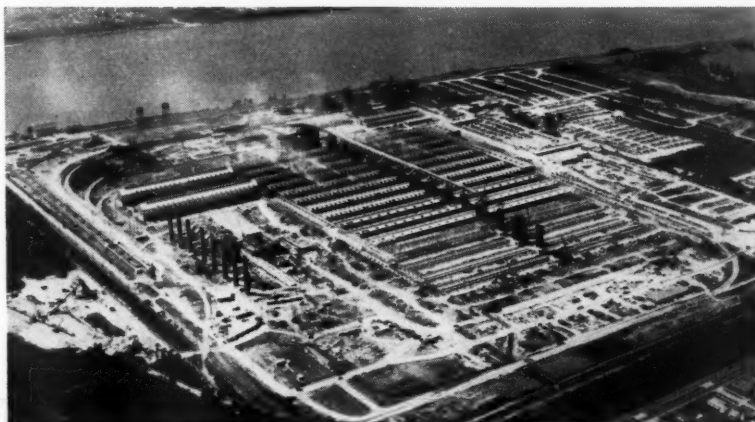
A new milestone was set in 1952 in the use of aluminum on ships. The U. S. Lines superliner, *United States*, which went into operation in July, carries the largest aluminum assembly in existence—her 600-ft superstructure. Use of the lightweight metal in this ship, largest commercial vessel ever built in the United States, contributes substantially to her maneuverability and high speed. With more than three score applications of aluminum on this 990-ft, 52,000-ton liner, the stage has been set for an increasing use of the lightweight metal on boats of all types and sizes.

Use of aluminum in buildings continued on a large scale during 1952 and will undoubtedly expand further when restrictions are removed. Roofing material, wall panels, windows, and building fronts continue as the most important applications in this field.

These and other developments during 1952 presage a role of increasing importance for aluminum which has now moved into position as the No. 1 nonferrous metal.



Bauxite mines in Jamaica started ore shipmen's



When completed this aluminum smelting plant in Louisiana will have an annual capacity of 200,000 tons



Seventy-five percent of the coal mined underground is still carried in mine cars

Underground Coal Transportation

Continuous Transportation To Match Continuous Mining Is the Goal To Strive For

By NEWELL G. ALFORD

Consulting Engineer
Pittsburgh, Pa.

EVERY year underground transportation of the nation's bituminous coal production, uses huge amounts of manual labor and mechanical work in haulage from the face to the surface.

This though has the earmarks of a platitude—merely because it is so often stated. It has been an elusive subject and, despite pioneering in some outstanding installations, it remains largely the prosaic job of moving a ton of coal through the mine from one place to another.

Relative importance to the industry of its underground haulage is shown in statistics gathered annually and processed by the U. S. Bureau of Mines. Incident to the economic conditions, and not as indicative of trends in the coal business, Table No. 1 is a rearrangement of these figures as reported and stresses the size of this haulage job.

Two Types of Transportation

A glance at the total number of units that the industry uses in each of the two general types of underground transport, rail haulage and conveyors, is shown as rearranged from the re-

sults reported by the U. S. Bureau of Mines, in Table No. 2.

These data, unfortunately, are not always reported by operators in a manner that permits distinguishing between total number of units in equipment inventory and those in active service. As a result there is no reliable information available to show the trend to larger mine cars, longer trips, higher speeds and heavier locomotives.

Answers to the U. S. B. M. questionnaire from operators about their conveyors do not consistently discriminate between units actually on the job and those not yet installed. Neither do the answers reflect stages of develop-

ment where final capacities are as yet not realized.

With the above limitations, Table No. 2 gives the number of units—or bulk of equipment—in underground coal mines, with the warning that deductions should not be drawn about performance trends.

From its census of coal's underground conveyor transport, the Bureau has obtained a sharper, more accurate composite. Generally the equipment is newer, the records are fresher and there is probably some statistical pride in accomplishment.

The Bureau's report shows the aggregate, annual mileage of underground conveyor units operating at 500 ft or over in length. From the supplementary data supplied, the total annual bulk-distance is determined for the conveyor-hauled coal in underground mines, excluding conveyors in main slopes. These volumes of annual conveyor performance are given in millions of ton-miles in Table No. 3.

Effect of Extraneous Impurities

An increasing burden to underground haulage results from the use of mechanical loaders and continuous miners. Of this raw mechanical tonnage, 12 percent or more consists of dirt partings and non-saleable rejects

TABLE I—Amount of Coal Carried Yearly by Various Haulage Methods

Type of Underground Transport	1949		1950		1951	
	Mil. Tons	%	Mil. Tons	%	Mil. Tons	%
BY Trolley Locomotives and Scattered Stationary Rope Hauls	262	79	300	77	316	76
BY Conveyors—500 ft and over in length (Exclusive of Main Slopes)	70	21	92	23	100	24
Approximate Total Underground	332	100	392	100	416	100

TABLE II—Number of Units for Trolley and Rope Hauls and for Conveyors in Service by Years

Haulage Units in Equipment Inventory	1949	1950	1951
Trolley Locomotives and Scattered Stationary Rope Hauls	15,163	14,859	14,243
Conveyors—500 ft and over in length (Exclusive of Main Slopes)	860	1,013	1,094

TABLE III—Main Conveyor Haulage Performance by Years

	1949	1950	1951
Total Miles of Conveyor in Operation	247	295	325
Millions of Ton-Miles, Coal Carried	201	269	296

present in most coal seams currently mined, and where served by surface cleaning plants. While these conditions are unavoidable with modern methods, the volume of extraneous impurities is an import factor in haulage requirement estimates.

In the last 30 years there has been little change in the average thickness of coal seams mined throughout the nation. (See USBM I. C. No. 7642 by Messrs. W. H. Young and R. L. Anderson.) General observation indicates that the average thickness of mining has been maintained at the expense of mining, hauling and removing larger volumes of dirt present in the coal at the face.

So much for the volume-importance of the underground haulage job.

Need for Planning Evident

In the smaller and older deep-mines, haulage was not planned at the outset in the current sense—it “just grew”—so that there are perhaps over 5000 such mines where radical renovation of haulage, for several sound reasons, is not an economical proposition. In many of these, an opportunity for measurable savings in haulage costs would be hard to find.

In the larger, newer installations, underground transport is frequently treated as a major division of coal production. With a wider range of mechanical refinements, automatic gadgets and controls, a closer approach to automatic operation is now possible in underground haulage or conveying; closer that is, to the realization of a continuous flow of deep-mined coal to the surface. The benefits, of course, must be achieved with minimum costs for operating and maintenance labor and also for power.

The capital cost of the maximum in automatic haulage will be high. This necessarily limits installation to plants planned for big daily output with ample coal reserves. With continuing progress in development of automatic equipment and in material handling ingenuity, obsolescence allowances assume major importance, in addition to depreciation. Original design will be revised and equipment will be replaced to keep in step with the pressure for lower labor costs. Original design of haulage now becomes more a problem in flexibility and a point of departure for anticipating and avoiding interruptions.

Under some conditions, providing

flexibility for a growing haulage demand depends on larger mine cars, longer trips at higher speeds calling of course, for heavier locomotives, increased care of sturdier roadbeds and heavier rail. So far as is known, there is no published case study of the economic limits with such a layout compared to complete conveyor transportation, although in either plan the advantages come mainly from the bigger volumes of underground production. Distinguishing costs may be affected by the general character and variation in roof support requirements and kindred conditions.

Roof Bolting is Beneficial

Large capacity conveyor installations have related problems in underground supply distribution which are simplified where roof bolting serves as roof support.

At the Orient No. 3 Mine in Illinois, where the roof conditions are none too favorable, no materials are handled on conveyor belts. At this mine, H. A. Treadwell states that the Chicago, Wilmington and Franklin Coal Co. expects to exhaust its coal entirely with belt haulage and has no plans for main line car haulage.

Orient No. 3 has track parallel to main belt lines, and into various panels, over which material is distributed with battery locomotives. This is believed to be the cheapest way to handle supplies as well as the quickest and easiest method of transferring equipment from one mine section to another. For the conditions in this property, the exacting original estimate favored belt transport as against pit cars with motor haulage. It is felt that the selection of equipment for this installation was a sound one.

Current literature gives numerous examples where conditions favored various types of relatively large mine cars of the solid and bottom-dump varieties.

Ingenious management at some plants has developed such items as automatic mine-car loaders for conveyor belt discharge. There is also an automatic locomotive car-haul where lugs, on the side of the track, engage and operate limit-switch controls that save some labor. But these savings are by no means considerable in the present stage of development.

The search for more economical underground haul and for larger output stems from the need for greater and greater coal capacity with continuous haulage to service continuous mining or mechanical loading.

Among some of the leading companies that have pioneered in these developments are: West Kentucky Coal Co., Oglebay, Norton & Co. in Ohio and the Chicago, Wilmington and Franklin Coal Co. in Jefferson County, Illinois. In the Taylorville district in

(Continued on page 123)



Year by year, conveyor haulage is growing in importance

Silver

Coinage Demands Up; Industrial Use At High Level as Domestic Output and Imports Drop

By HON. PAT McCARRAN

United States Senator from Nevada



ONE of the outstanding developments in the international field of silver in 1952 was that arrangements were concluded by the Indian Government for the construction of a silver refinery to be located at Alipore, near Calcutta, at a cost of \$1,200,000. According to an announcement by the Indian Government in October of last year this refinery is scheduled to be in production by the early part of 1954, and its first undertaking will be the extraction of silver from the 4-anna (quarter rupee) coins issued during World War II. It is said that these coins contain about 300,000,000 ounces of silver and an equal amount of copper. It is also stated that subsequently the copper refining section of the plant will be expanded. This silver refinery will be the only one of its kind in Asia.

According to an announcement by the Finance Minister of India, Mr. C. D. Deshmukh, India expects to repay to the United States the 226,000,000 oz. of silver acquired for coinage purposes under the lend-lease program during World War II. Since the advent of the political separation of Pakistan from India an agreement was reached between these two Indian countries which provided that each Dominion was liable for the silver held in its surplus stocks as of August 15, 1947, plus the silver obtained in each Dominion by the retirement of quarter-annular silver coins between August 15 and the date of the discharge of the liability to the United States. The balance of the indebtedness is to be shared between Pakistan and India in the ratio of 17½ and 82½ percent, respectively, according to the announcement of the Finance Minister.

In connection with the silver lend-lease program, the United States Treasury on April 28, 1952, notified all countries which received silver under lend-lease that the President declared officially the emergency to have ended on that date, and that such countries will be expected to repay in

kind their respective amounts of silver indebtedness. In the cases of Ethiopia and Saudi Arabia two additional years were added to the period in which they would be required to repay their silver debts, and in the case of India an extension of two years was granted on the return of 100,000,000 ounces of the 226,000,000 ounces lend-leased. Belgium is the only country that has repaid her silver lend-lease debt which amounted to 261,333 ounces, leaving 410,553,011 ounces still outstanding under lend-lease.

Silver Production Down

The domestic production of silver in 1952 declined slightly below that of 1951, due chiefly to the fact that a lower silver content was contained in copper, lead, and zinc ores. This trend has been evident for some time and is not likely to change until and unless the price paid the domestic miner for his silver is restored to the monetary value of \$1.29 per fine ounce, which I am confident will be accomplished.

Although final figures are not available as of this writing, it is doubtful if domestic production of silver in 1952 exceeded 39,000,000 oz. Domestic production in 1951 was 39,766,779 fine ounces.

The Western Hemisphere not only continues to be the greatest source of newly mined silver, with Australia and Japan the principal foreign sources, but the proportion of world production in this Hemisphere is increasing. From the best information available, mines located in the Western Hemisphere last year produced approximately 82 percent of the world production. This indicates the importance that silver values play in the production of nonferrous metals in this part of the world, and silver values determine to a considerable extent the total value of the metalliferous ores. They have a direct bearing on the market value of the base

metals of which silver is a by-product. I have been stressing this point for many years and still have hope that the Executive Branch of our Government will give due consideration to this fact.

Price Fluctuations Small

The New York price of silver in 1952 moved in a narrower range than in the preceding year. The world price on January 1 was 88 cents per fine ounce and it remained at that figure until May 6, when it dropped to 87 cents. On May 13 the price receded to 86 cents; to 85 cents on the 15th; 84 cents on the 16th, and to 82¾ cents per fine ounce on the 28th. The price remained at 82¾ cents until July 24 when it rose to 83¾ cents per fine ounce, at which price it was stabilized throughout the remainder of the year. Although the price range was narrower in 1952, the annual average price was 84.941 cents as compared with the higher annual average price in 1951 of 89.368 cents per fine ounce. This compares with the annual average price in 1950 of 74.169 cents, 1949 of 71.930 cents, and 1948 of 74.361 cents per fine ounce. Undoubtedly, the higher annual average price during the past two years was influenced largely by supply and demand, both for coinage and industrial purposes.

The influence of the Bank of Mexico on the silver market in 1952 remained a potent factor. The fact that Mexico, like the United States, continues to mint and circulate silver coins in large quantities is one of the principal factors in the demand for newly mined silver.

With several minor deviations during the year the price of silver on the London market followed closely the New York market quotations.

In Bombay the silver market was influenced to a great extent by the restrictions imposed by the Indian au-

thorities, principally the import embargo. Fluctuations in the exchange rate of the rupee with the dollar have reduced the dollar price of silver in the Bombay market almost 50 percent since 1937. At that time 2.659 rupees equaled one U. S. dollar, but since then the rupee has lost considerable value in terms of dollars and at the end of 1952 the rate declined to 4.78 rupees per dollar. The exchange rate has a direct bearing on the dollar price of silver in India. During 1952 the price of silver on the Bombay market declined from 193 rupees per 100 tolas to 141 rupees per 100 tolas, while the exchange rate of the rupee with the dollar also declined last year from 4.768 to 4.808 rupees per dollar, thus affecting materially the stability of the Bombay market price of silver, which varied from the equivalent of \$1.07 an ounce to 78.8 cents an ounce.

Coinage Demand Increased

Requirements for domestic silver subsidiary coinage in 1952 of 57,337,896 ounces exceeded coinage demands in 1951 by 12,897,959 ounces. No silver dollars were coined during the year.

U. S. Mints also coined 2,235,280 ounces for Cuba and Honduras. In both cases these countries supplied their own silver, some of which came from old coins and the remainder from purchases in the open market.

Increased silver coinage in foreign countries last year was hailed as an indication of the necessity for returning to hard money. Especially is this true in the Tropical countries. Saudi Arabia's monetary reserves were increased by approximately 23 million ounces of silver coined into riyals by the Mexican Mint. Germany also minted approximately 8,800,000 5-mark coins. Additional coinage in Canada last year consumed approximately 4,000,000 oz. of silver.

More Silver Circulating

Last year the number of silver dollars in the hands of the public rose from \$188,639,515 on January 1 to \$199,203,340 on December 31, 1952. Also reflected in this increase is the fact that the number of silver dollars per capita rose from \$1.21 to \$1.26 during the past year. The popularity of the silver dollar continues to increase.

Subsidiary silver in circulation also

showed an appreciable rise during the same period from \$1,072,685,442 on January 1 to \$1,141,020,751 at the end of the year.

Silver certificates, which represent the largest single silver-money item, increased from \$2,079,109,734 in circulation to \$2,103,498,673 from January 1 to December 31. During 1952 silver bullion against which silver certificates were issued was added to our monetary reserves and monetized in the amount of \$37,167,421.31.

Silver imports for 1952 as compared with 1951 showed a marked decrease, reflected largely in shipments from Canada, Mexico and Cuba. Silver imports (except coin) in the form of ore and base bullion amounted to 30,869,455 oz. and refined bullion 44,687,147 oz. making a total of 75,556,602 oz.

Silver exports of refined bullion last year amounted to 2,030,418 oz., a considerable decrease over 1951.

The Government of Saudi Arabia announced that effective October 22, 1952, gold sovereigns of the same weight and fineness as the British sovereign will be minted and placed in circulation. Each gold sovereign is now valued at U. S. \$8.2397¹ and contains 113.0016 grains of fine gold and is equivalent of 40 silver riyals. Each riyal contains 165 grains of fine silver and is of .916667 fineness, and consists of 22 qurush,² these quotations to hold unless there are important changes in the international prices of gold and silver. The Monetary Agency of Saudi Arabia states (1) that it will buy and sell its gold sovereigns at the rate of 40 silver riyals per sovereign; (2) that in its dealings with the public in transactions of not less than 1,000 gold sovereigns it will sell at 40 riyals and 2 qurush and buy at 39 riyals and 20 qurush; (3) that it will endeavor to prevent wide fluctuations in foreign exchange rates in the domestic market; and (4) that Saudi Arabian banks must submit monthly balance sheets of their exchange transactions. This development is significant in that it provides an opportunity for the free exchange of gold and silver coins at fixed values for each money metal.³

Industrial Use of Silver

The industrial use of silver continues at a high level although the total amount consumed in 1952 was approximately 15,000,000 oz. less than in 1951. New uses for silver are being employed in chemical, mechanical, electrical and electronic fields. Silverware manufacturers last year consumed less silver in proportion to the total industrial consumption than was the case immediately following the close of World War II. Manufacturing plants which normally produce luxury goods such as silverware and hollow ware had been converted into

defense plants, with little or no silver allotted for manufacture of peacetime items. The pent-up demand for household products was over-estimated by the trade. As a result, inventories were overstocked and their liquidation consequently prolonged. The importance of silver in ever-increasing industrial fields is generally recognized and this factor in the future will exert a larger measure of influence on consumption as well as on the world price of silver.

"Free Silver" Decreasing

As has been the case for many years, bullion brokers and manufacturers continue to wield a powerful influence on the market price of silver together with the provision in the Act of July 31, 1946, which favors industrial consumers of silver by making Treasury "free" silver available at approximately 91 cents an ounce. Since the Treasury's stock of "free" silver continues to decline it should not be too long before the privilege of purchasing such Treasury silver by industrial users will come to an end. The amount of "free" silver in the General Fund dropped from 126,970,945 oz. on December 31, 1951, to 81,697,548 on December 31, 1952, a reduction of 45,273,397 oz.

It will soon be incumbent upon the new Administration to establish a policy limiting the remaining amount of silver available from this source for industrial purposes. Demands for domestic coinage must be met and the "free" silver in the General Fund of the Treasury will continue to serve as its principal source of supply. When "free" silver is no longer available for industrial uses and silver in the open market becomes insufficient to meet these needs, industry will still be able to purchase silver from the Treasury at \$1.29 an ounce, the monetary value of which silver dollars and silver certificates are placed in circulation. This fact should give comfort to the large consumers of silver in the United States, and the payment of this amount by the Treasury to the domestic miner for his newly mined silver would enable him to continue to produce this much needed and vitally important metal.

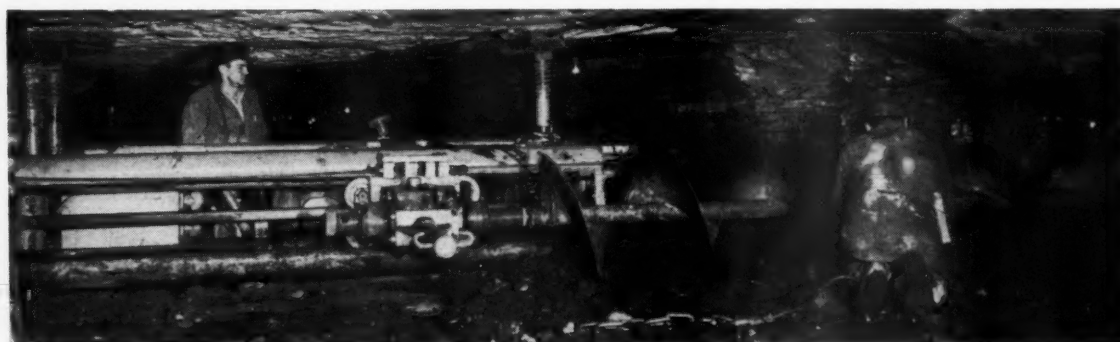
The bills introduced in the House of Representatives during the 82nd Congress designed to repeal existing silver purchase laws failed to receive consideration in the House and died at the close of the previous Session of Congress. Any attempt to secure favorable consideration of such legislation reintroduced during the 83rd Congress will meet with the same stern opposition as heretofore. I am not only opposed to the repeal of existing silver statutes, but will exert every effort to improve the position of silver whenever an opportunity is afforded.

¹ At \$35 per fine ounce.

² A minor coin of cupro-nickel.

³ The amount of fine gold in the Saudi Arabian sovereign is 113.0016 grains and the amount of fine silver in 40 riyals is 6,600 grains which provides a basis of exchange of coins of these metals at a ratio of approximately 58 to 1. This ratio differs considerably from that of the N. Y. price of \$8.25 cents an ounce of silver and \$35 an ounce of gold, but the silver premium to holders of gold no doubt is sufficient to discourage the melting of silver riyals.

Sales of Coal Mine Equipment



The underground auger demonstrated its possibilities

Percentage of Coal Mined Mechanically Increases. Facts and Figures Given

By W. H. YOUNG and R. L. ANDERSON

Respectively, Chief, Bituminous Coal and Lignite
Section, and Mining Engineer,
U. S. Bureau of Mines

SHIPMENTS of mechanical loading equipment for underground use in coal mines in the United States, in terms of capacity, were 34 percent less in 1952 than in 1951 and the capacity of mechanical cleaning equipment for use at bituminous coal mines was 37 percent less. Shipments of shuttle cars and face conveyors for use in coal mines in the United States decreased 16 and 25 percent, respectively, in 1952 and 1951, while "mother" conveyor shipments decreased 40 percent during the same period.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical cleaning equipment for bituminous coal mines and manufacturers of mechanical loading and supplementary haulage equipment for use in all coal mines in the United States. Data from various trade journals were also utilized.

Mechanical loading units and supplementary haulage equipment "Sales in 1952" represent shipments made during 1952. Twenty-seven percent of the total capacity of mechanical cleaning equipment sold in 1952 was placed in operation during that year; the remainder will be installed later.

Mechanical Loading

Bituminous coal and lignite mechanically loaded in underground mines increased from 272,724,612 tons in 1950 to 304,255,921 tons in 1951, or 12 percent. Mechanical loading in Pennsylvania anthracite mines decreased from 12,335,650 tons in 1950

to 10,847,787 in 1951, or 12 percent.

Table I shows data on bituminous coal and lignite production by methods of mining and mechanical cleaning for 1950-52, inclusive. The percentage of

this total output mechanically loaded and mechanically cleaned continues to increase. During 1952, approximately 81 percent of the total output was either mechanically loaded at underground mines or loaded by power shovels at strip mines.

Underground production of bituminous coal and lignite, by methods of loading, is shown in Table II. Preliminary figures for 1952 show that 76 percent of the underground output was loaded mechanically and the remainder, or 24 percent, was hand loaded into mine cars.

Types of units sold—Table III lists

TABLE I—BITUMINOUS-COAL AND LIGNITE PRODUCTION, BY METHODS OF MINING AND MECHANICAL CLEANING, IN THE UNITED STATES, 1950-52, INCLUSIVE

	1950 Thousands of net tons	% of total	1951 Thousands of net tons	% of total	1952 ¹ Thousands of net tons	% of total
Surface stripping	123,467	23.9	117,618	22.0	103,000	22.2
Hand-loaded underground ..	120,119	23.3	111,791	21.0	88,000	18.9
Mechanically loaded under- ground	272,725	52.8	304,256	57.0	274,000	58.9
Total production ..	516,311	100.0	533,665	100.0	465,000	100.0
Mechanically cleaned	198,699	38.5	240,010	45.0	230,000	49.5

¹ Preliminary.

TABLE II—UNDERGROUND BITUMINOUS-COAL AND LIGNITE PRODUCTION, BY METHODS OF LOADING, 1950-52, INCLUSIVE

	1950 Thousands of net tons	% of total	1951 Thousands of net tons	% of total	1952 ¹ Thousands of net tons	% of total
Loaded by machine.....	237,279 ²	60.4	266,673 ³	64.1	(⁴)	(⁴)
Handled by conveyors....	35,446 ⁵	9.0	37,583 ⁶	9.0	(⁴)	(⁴)
Total mechanically loaded	272,725	69.4	304,256	73.1	274,000	75.7
Hand loaded	120,119	30.6	111,791	26.9	88,000	24.3
Total underground pro- duction	392,844	100.0	416,047	100.0	362,000	100.0

¹ Preliminary.

² Includes mobile loaders, continuous mining machines, scrapers and conveyors equipped with duckbills or other self-loading heads.

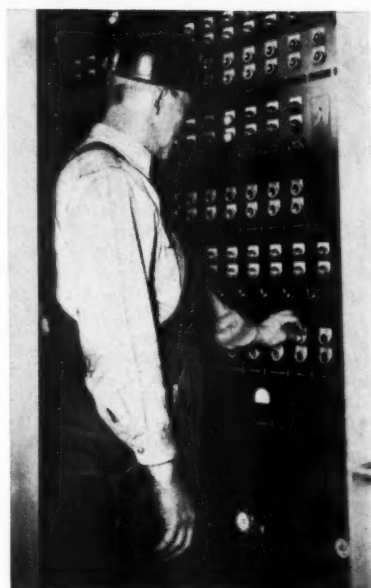
³ Includes mobile loaders, continuous mining machines, scrapers, conveyors equipped with duckbills or other self-loading heads, and augers.

⁴ Included under "Total mechanically loaded."

⁵ Includes hand-loaded conveyors and pit-car loaders.

⁶ Hand-loaded conveyors.

the number of mechanical loading and conveyor units shipped for underground use at all coal mines in the United States, 1947-52, inclusive. Shipments of mobile loaders, which include continuous mining machines, decreased from 287 in 1951 to 206 in



Modern slope belts require intricate electrical controls

1952. Shipments of scrapers increased eight percent and shuttle car sales decreased 16 percent from 1951. "Mother," room or transfer, and face conveyor sales all decreased.

Exports of underground mechanical-loading equipment in 1952, in terms of capacity, amounted to 41 percent of the shipments to mines in the United

TABLE III—NUMBER OF MECHANICAL LOADING AND CONVEYOR UNITS SOLD FOR UNDERGROUND USE IN COAL MINES, AS REPORTED BY MANUFACTURERS, 1947-52, INCLUSIVE

Type of equipment:	1947	1948	1949	1950	1951	1952	Change from 1951 (percent)
Bituminous-coal and lignite mines:							
Mobile loading machines ¹	485	723	286	280	287	206	— 28.2
Scrapers ²	12	17	8	1	4	8	+100.0
Shuttle cars	(³)	(³)	543	465	524	440	— 16.0
Conveyors: ⁴							
"Mother"	200	230	116	132	114	67	— 41.2
Room or transfer	846	1,025	394	316	297	155	— 47.8
Face ⁵	224	356	160	116	111	76	— 31.5
Anthracite mines (Pennsylvania):							
Mobile loading machines	1	2					
Scrapers ²	23	32	10	8	8	5	— 37.5
Shuttle cars	(³)	(³)					
Conveyors: ⁴							
"Mother"	4	5		1			
Room or transfer	141	184	147	57	34	34	
Face ⁵	1	18	5		8	13	+ 16.3
Number of manufacturers reporting	23	22	22	20	21	22	

¹ Includes continuous mining machines, beginning in 1948.

² Reported as scrapers or scraper haulers and hoists.

³ Not available. Total number of shuttle cars sold 1936-48, inclusive, was 2,849.

⁴ Conveyors are classified as to the length the power unit has capacity to take: "Mother," capacity over 500 ft; room or transfer, capacity 100 ft to 500 ft; face, capacity under 100 ft.

⁵ Includes "bridge" conveyors, beginning in 1950.

States compared with 23 percent in 1951.

Types of mechanical-loading equipment sold compared with units in use—Table IV shows the trend in demand for various types of mechanical-loading equipment. There has been a substantial increase in the use of mobile loading and continuous mining machines, however, all other types have registered a decrease in recent years.

Table V shows the number of mechanical loading units shipped to various states in 1952 compared with the number in use in 1951, as reported by mine operators. Sales of room

conveyors as listed in Table V are not exactly comparable with the number of room conveyors in use. To avoid duplication in tonnage mechanically loaded, the mine operator was instructed to report "hand-loaded" and "self-loading" conveyor tonnage only; therefore, room conveyors loaded by mobile loaders are not included in "room conveyors in use in 1951."

Coal augers—The use of augers for coal recovery began about 1945. Data on sales of augers are shown for the first time in Table VI. Reports were received from four manufacturers. Practically all shipments to date have

TABLE IV
SALES OF MECHANICAL-LOADING EQUIPMENT IN 1952 COMPARED WITH MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use, as reported by mine operators							Number of machines sold as reported by manufacturers in 1952
	1945	1946	1947	1948	1949	1950	1951	
Bituminous-coal and lignite mines:								
Mobile loading machines	2,590	3,200	3,569	3,980 ¹	4,205 ¹	4,318 ¹	4,410 ²	206 ¹
Scrapers	87	75	67	56	46	39	22	8
Pit-car loaders	142	93	71	37	17	12	(³)	(⁴)
Conveyors equipped with duckbills or other self-loading heads	1,383	1,521	1,531	1,632	1,483	1,329	1,242	(⁵)
Hand-loaded room conveyors, number of units	3,385	3,470	3,979	4,125	4,312	4,434	3,904	155
Anthracite mines (Pennsylvania):								
Mobile loading machines	20	27	25	19	27	30	43	5
Scrapers	548	564	594	643	589	556	528	
Hand-loaded room conveyors, number of units ⁶	3,006	3,223	3,457	3,562	3,618	3,460	3,282	34

¹ Includes continuous mining machines.

² Includes continuous mining machines and augers.

³ Canvass of pit-car loaders in use discontinued in 1951.

⁴ Canvass of sales of pit-car loaders discontinued in 1945.

⁵ Sales of conveyors equipped with duckbills or other self-loading heads are included with hand-loaded room conveyors.

⁶ Includes pit-car loaders and conveyors equipped with duckbills or other self-loading heads.

been for use in strip mines. No shipments have been made for use in Pennsylvania anthracite mines.

Haulage Equipment

Face conveyors—A face conveyor is 10 to 100 ft in length and is used parallel to the face of the room to move material along the face to a room conveyor. Table III lists total



About 35 percent of cleaning equipment sold went into new plants

sales 1947-1952, inclusive, and Table VII lists sales, by states, for 1951 and 1952. Data on number in use are not available.

Shuttle cars—Sales of shuttle cars decreased from 524 in 1951 to 428 in 1952. Details of shipments to various states in 1951 and 1952 are given in Table VII. There were 3758 shuttle cars in use in bituminous coal and lignite mines in 1951. Details of the number of cable-reel and battery-type shuttle cars in use, by states, 1949-51, inclusive, are given on page 25, U. S. Bureau of Mines Mineral Market Report 2102. Exports of shuttle cars decreased seven percent in 1952 from 1951.

"Mother" conveyors—For the purpose of this study a "mother" conveyor is defined as a sectional, extensible, power-driven conveying unit that can handle over 500 ft of conveyor. Main-slope conveyors are excluded. Table III lists sales, 1947-52, inclusive, and Table VII shows shipments by states, in 1951 and 1952. In 1951, 372 bituminous coal mines used 325 miles of "mother" conveyors. Detailed data by states on "mother" conveyors in use, 1945-1951, inclusive,

TABLE V
MECHANICAL-LOADING EQUIPMENT IN ACTUAL USE IN 1951, BY STATES, COMPARED WITH SALES REPORTED IN 1952

	Mobile loaders		Scrapers		Room conveyors ¹	
	In use in 1951 ²	Sales in 1952 ³	In use in 1951	Sales in 1952	In use in 1951	Sales in 1952
Bituminous coal and lignite mines:						
Alabama	144	7	1	..	235	..
Alaska	..	..	..	..	2	..
Arkansas	..	..	..	..	85	..
Colorado	40	..	1	6	279	8
Illinois	475	13	..	..	20	5
Indiana	158	1	..	..	4	1
Iowa	2	..	..	..	4	..
Kentucky	500	19	..	..	605	23
Maryland	4	..	..	..	18	..
Montana	30	..	..	..	14	..
New Mexico	16	..	..	..	1	7
North Dakota	3	1	..	..	..	..
Ohio	229	5	..	..	95	..
Oklahoma	5	1	..	1	131	..
Pennsylvania	1,015	58	12	..	895	18
Tennessee	36	1	..	..	110	2
Utah	127	6	..	1	85	..
Virginia	131	7	1	..	208	..
Washington	1	3	6	..	93	1
West Virginia	1,462	82	..	..	2,030	90
Wyoming	32	2	1	..	232	..
Total bituminous coal and lignite	4,410	206	22	8	5,146	155
Pennsylvania anthracite mines	43	..	528	5	3,282 ⁴	34
Grand Total	4,453	206	550	13	8,428	189

¹ Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.

² Includes continuous mining machines and augers.

³ Includes continuous mining machines.

⁴ Includes also pit-car loaders.

TABLE VI
DATA ON SALES OF COAL RECOVERY AUGERS TO BITUMINOUS COAL MINES IN THE UNITED STATES, 1945-1952, INCLUSIVE

	Surface or strip mines	Underground mines
Number of augers shipped	259	12
Diameter of augers:		
Minimum	16 in.	18 in.
Maximum	52 in.	30 in.
Length of auger sections:		
Minimum	6 ft	4 ft
Maximum	34 ft	6 ft
Maximum depth of hole recommended by manufacturer	204 ft	100 ft

TABLE VII—SALES OF FACE CONVEYORS, SHUTTLE CARS, AND "MOTHER" CONVEYORS, 1951-52, BY STATES

	Face conveyors ¹		Shuttle Cars		"Mother" conveyors	
	1951	1952	1951	1952	1951	1952
Bituminous-coal and lignite mines:						
Alabama	..	..	26	35	..	..
Colorado	2	3	6	5	6	..
Illinois	..	..	70	14	19	14
Indiana	..	..	4	..	..	..
Kentucky	24	13	46	42	18	17
New Mexico	..	..	..	..	..	2
Ohio	..	..	20	4	2	1
Oklahoma	..	4	..	2	3	..
Pennsylvania	19	10	131	127	24	6
Tennessee	..	..	6	2	1	..
Utah	..	..	8	7	2	1
Virginia	6	2	8	24	3	..
West Virginia	60	44	197	166	36	26
Wyoming	..	..	2	..	..	..
Total	111	76	524	428	114	67
Anthracite mines (Pa.)	8	13	..	..	..	..
Grand total	119	89	524	428	114	67

¹ Includes "bridge" conveyors and all other conveyors from 10 to 100 ft in length

are given on pages 26 and 27 of Bureau of Mines Mineral Market Report 2102. Exports of "mother" conveyors decreased 20 percent in 1952 from 1951.

Coal Cleaning Equipment

Reports from 19 manufacturers of bituminous coal cleaning equipment show that the total capacity of 1952 sales was 8700 net tons of clean coal per hour, compared with a 13,900-ton capacity sold in 1951, a decrease of 37 percent. Sales in 1952, by type of equipment, in terms of capacity, show that jigs were first, followed by dense medium and pneumatic methods. The capacity of all types of equipment sold in 1952 for cleaning bituminous coal by wet methods, was equivalent to five percent of the bituminous coal cleaned by wet methods in 1951, while the capacity of pneumatic equipment sold in 1952 was 10 percent of the tonnage pneumatically cleaned in 1951. Approximately 65 percent of the total capacity of cleaning equipment sold in 1952 was for additions to present installations and the remainder comprised new plants.

Table VIII gives data on bituminous coal cleaned in 1951 by states and the annual capacity of equipment sold in 1952.

TABLE VIII
BITUMINOUS COAL MECHANICALLY CLEANED IN 1951 COMPARED WITH
SALES OF MECHANICAL CLEANING EQUIPMENT IN 1952, BY STATES

State	Number of plants in operation	1951 Net tons of cleaned coal	Output mechanically cleaned (percent)	Annual capacity of equipment sold in 1952 (net tons) ¹
Alabama	48	11,069,682	81.4	
Alaska	2	195,241	39.5	
Arkansas	2	17,916	1.6	
Colorado	6	1,649,012	40.2	
Illinois	67	39,606,748	73.1	1,160,000
Indiana	27	14,060,674	72.3	1,035,000
Kansas	5	1,189,092	60.6	
Kentucky	75	26,923,389	35.9	1,633,000
Missouri	10	2,865,138	87.6	
Montana	2	126,115	5.4	
New Mexico	1	59,635	7.6	
Ohio	29	13,939,962	36.7	
Oklahoma	6	692,692	31.2	
Pennsylvania	83	46,325,054 ²	42.8	3,929,000
Tennessee	9	607,392	11.2	
Utah	6	2,639,335	33.2	(³)
Virginia	29	7,356,766	34.4	(³)
Washington	17	809,619	94.5	(³)
West Virginia	201	70,476,346 ⁴	43.2	3,071,000
Undistributed				1,481,000
Total	625	240,009,808	45.0	12,309,000

¹ Based on average days mines were active in 1951 and 7.0 hours per day.

² Includes some coal mined in Pennsylvania and cleaned in Ohio, and a small tonnage mined in other states and cleaned at a consumer-operated plant in Pennsylvania.

³ Included in "Undistributed."

⁴ Includes some coal mined in West Virginia and cleaned in Pennsylvania.

Tungsten

With Supply and Demand in Closer Balance and New Production Goals Set, Future Looks Brighter at End of Year

By CHARLES H. SEGERSTROM, Jr.

President, Nevada-Massachusetts Co.

A REVIEW of the tungsten industry for 1952 reveals a marked change in the supply and demand picture for this strategic mineral. The International Materials Conference, which has been allocating the free world supplies of tungsten, announced that international distribution plans for tungsten would be discontinued after December 31, 1952. The IMC stated that the steady improvement in the supply position together with the easing of market conditions was the reason for this action. The National Production Authority has dropped allocations of pure tungsten and ferro-tungsten while the Defense Materials Procurement Agency is considering the removal of allocations on tungsten ores and concentrates. Defense Production Administration has dropped tungsten from its list of "most critical" materials. At the end of 1952, the supply and demand picture is in much closer

balance than it was at the start of the year.

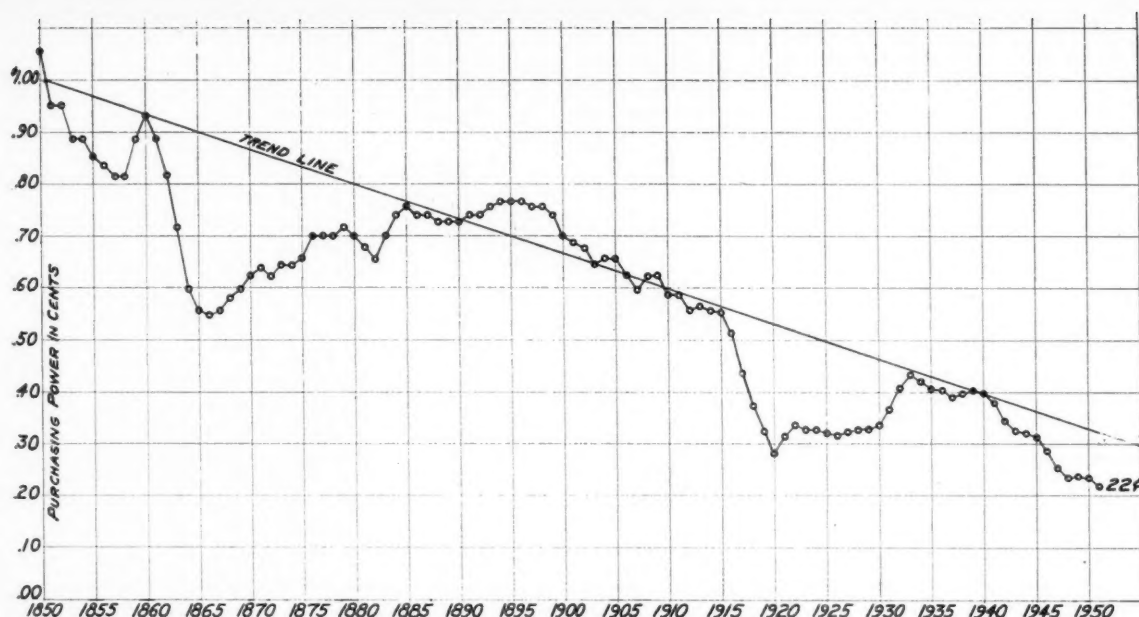
The ceiling price of \$65 per short ton unit of WO₃, established April 6, 1951, continued in effect. The Domestic Tungsten Program of General Services Administration has been of great benefit to producers in this country. This program provides for the purchase of standard-grade concentrates by the government at a price of \$63 per short ton unit, less penalties for over maximum percentages of impurities. This program will terminate when 3,000,000 units have been delivered to the government or on July 1, 1956, whichever occurs first. During the year, GSA raised the allowable molybdenum content in tungsten concentrates from 0.40 percent to 2.75 percent. This change in specifications was a great help to many domestic producers. The programs of other government agencies to stimu-

late the mining of critical metals, such as exploration loans, were of aid in the discovery and development of new tungsten ore bodies.

Domestic Production Up

Domestic production of tungsten in 1952 is estimated at approximately 7000 short tons of 60 percent WO₃ which is an improvement over the 6167 tons produced in 1951. The increase came from larger production of the established companies as well as the starting up of new tungsten properties. Consumption of tungsten in 1952 fell off to an estimated 9150 tons compared with 11,989 tons in 1951. Imports for the first nine months were 12,704 tons compared to 6737 tons for 1951. It is presumed that most of the imports went into the stockpile as many foreign producers have long term contracts with our government.

During the year DPA established new expansion goals for tungsten. The goal set for tungsten in 1954 is a total supply of 34,000,000 lb of contained tungsten from both domestic and foreign sources. This is equivalent to approximately 35,000 short tons of 60 percent WO₃ and is much greater than the total supply available to the United States in 1952 from domestic and foreign sources. The domestic tungsten industry will most certainly do its part in the striving for this high goal, provided the incentive is there for the large expansion necessary to achieve this goal.



Decline in dollar's purchasing power, based on value \$1.00 in 1851, has been almost uniform

Gold

Total 1952 Output 21.2 Percent Below 1950 Post War Peak Production

By NEIL O'DONNELL

General Manager
Falconbridge Nickel Mines, Ltd.

THE lot of the gold miner is a hard one. The increasing difficulty of producing gold from low grade deposits is reflected in the production figures by decreased output. The post war peak of production came in 1950; since then those areas from which we receive gold from mines whose principal product is gold have shown a marked decrease in production.

Over-all production, including Alaska, was 2,394,231 oz. in 1950. Estimated production from all sources is 1,885,777 fine ounces,¹ for 1952.

Gold is derived from two major sources; those mines that are essentially gold mines and, from mines where gold is a by-product, principally large copper mines. The major decrease has occurred in the true gold mines in the states of California, South Dakota and Colorado as well as in Alaska. The most marked decrease is in California's production which decreased from

421,473 fine ounces in 1948, to 412,118 in 1950, to 253,553 fine ounces estimated for 1952, a decrease of 40 percent in four years. South Dakota's production has dropped from 567,996

fine ounces in 1950 to 484,556 oz. (estimated) for 1952, a decrease of 83,440 oz. in two years or 14.7 percent. Alaska decreased in output from 289,272 oz. in 1950 to 233,428 (estimated) in 1952—a decrease of 55,844 fine ounces or 19.3 percent.

In contrast the states which have within their borders the large scale porphyry coppers do not show a marked decrease except Nevada, although production in 1952 is lower in all than it was in 1950.

The figures are given below in fine ounces:

	1950	1952
Utah	457,551	437,600
Nevada	178,447	117,080
Arizona	118,313	113,500
New Mexico....	3,414	2,900

U. S. DOMESTIC GOLD PRODUCTION

	1950*	1951*	1952*
Alaska	289,272	239,637	233,428
Arizona	118,313	116,093	113,500
California	412,118	339,732	253,553
Colorado	130,390	116,503	120,000
Idaho	79,652	45,064	33,818
Montana	51,764	30,502	28,671
Nevada	178,447	121,036	117,080
New Mexico	3,414	3,959	2,900
Oregon	11,058	7,927	5,414
South Dakota	567,996	458,101	484,556
Texas	49	32	32
Utah	457,551	432,216	437,600
Washington	92,117	67,405	53,528
Wyoming		0	1
East of Mississippi	2,000	2,447	1,696
Total	2,394,231	1,980,663	1,885,777

* Based on latest available USBM figures reported in fine ounces. 1952 figures are 11 mos. reported and December estimated.

¹ U. S. Bureau of Mines Unofficial Estimate.

The cause of the decrease in production in the gold states is easily understood. Costs of production are rising and the selling price of gold has remained constant since 1934. The rising cost of production of gold is more marked since 1939 than during the period prior to 1939 but it has been going on for a long period of time, affecting the gold miner adversely. A curve recently prepared by the Department of Commerce shows that the purchasing power of the gold dollar has decreased from \$1.00 in 1851 to 22 cents in 1951. By gold dollar is meant the gold dollars delivered by the producers to the U. S. Government.

Purchasing Power Declined

This curve shows that the decline is almost uniform for the 100-year period, except for periods of war and reconstruction. The period since 1939 has been one of war and reconstruction so the purchasing power has been falling at a higher than normal rate, thereby affecting the producer of gold to the point where low grade mines are being abandoned and the many thousands of tons of low grade ore are removed from ore reserves of the nation and classified as unprofitable to mine.

The producers throughout the year, both national and international, have argued for a price increase for their product, or at least for the establishment of a free market. The truth of the matter is that our past administration had committed itself to international policies of such nature that either a price increase or establishment of a free market, would first require re-orientation of foreign policy and the administration was not prepared, or inclined, to effect such a re-orientation. The plans of the new ad-

ministration have not been disclosed but the industry will follow them with great concern.

Re-instate Gold's Power

It is my belief that while a price increase now would serve to prolong the life of existing mines and provide relief to harassed operators, the long term enemy is the constant decline in purchasing power because this phenomenon of our economy carries ever with it a signed death warrant for the industry. Some means must be found to remove this threat. To that end I propose that the operators first make a study of this problem; secondly, that they arrive at some conclusion among themselves as to a solution.

Their problem will be to find a way to get back to having our dollar—a gold dollar incidentally—re-instated to the place of power over the paper promise but also to find a means of giving this same gold dollar uniform purchasing power which is a far more difficult problem than the first one. Upon the solution of these problems depends the survival of the gold mining industry.

The purchasing power of the dollar dropped from \$1.00 to 22 cents in 100 years according to Department of Commerce figures. This is a decrease of 78 percent in 100 years or 0.78 percent per year, which means that the return to the gold miner has averaged 0.78 percent less each year for any given production of gold as against 1851 purchasing power. However, the decrease increases percentagewise. For example, when the purchasing power of a dollar is 10 cents in 1851 terms, a decrease of 0.78 percent based on 1851 figures is a decrease of 7.8 percent against the previous year and

this is what is really strangling the gold industry.

During the large part of the 100-year period we had convertibility. Despite this, purchasing power decreased steadily; therefore, the argument advanced by orthodox economists that the re-establishment of convertibility of the currency would give a yardstick for value comparable to the kilogram and the meter does not hold water.

Need Gold Yardstick

A point on which the economists and the gold miners could agree is the establishment of a real yardstick—a gold yardstick. However, I do not believe it can be fully achieved by the device of convertibility, at whatever price for gold. The establishment of a real yardstick would solve the problems of the gold miners and the economists alike and this is the problem to which they must address themselves.

To sum up the situation, we have a gold mining industry facing extinction, not because of exhaustion of reserves but because of decreasing return from mining gold ore. The decreasing return is due in large part to the decreasing purchasing power of money, a phenomenon of our economy which has manifested itself for over 100 years, the entire life of the industry in our country. If the industry is to survive, the gold miners and the economists must find a basis for cooperation in establishment of the paramount influence of gold so that the paper currency is quoted in terms of the gold dollar—our official currency—and not the price of gold quoted in terms of an ever-weakening paper currency. When this problem is solved the basic problem of the gold miner will be solved and his lot will not be a happy one until a solution is found.

Transportation

(Continued from page 115)

Illinois, Peabody Coal Co.'s new No. 10 mine has recently come into production with a projected plan for belt haulage for 14,000 tons per day. Its new No. 11 mine, for the same capacity, is in development and scheduled to start production late in 1954.

Manufacturers Are Active

Manufacturers of material handling equipment are alert to the needs of underground haulage. There have been meetings and forums of this group, the last of which was sponsored in October, 1952 by Westinghouse at Buffalo, N. Y. The papers presented at this meeting by various engineer-specialists were of a high order. The discussions include many

valuable data on the mechanics and economics of planning material handling.

The layouts that will repay analysis and study will be found at the newer installations where the daily volume of coal is large enough to justify a continuous bulk movement such as should theoretically be produced by continuous mining machines.

Review and Forecast

It is interesting to ponder the many and sundry applications of the wheel in our underground haulage—or any form of haulage for that matter. How old is the idea of the wheel—when was it first put to use?

According to the "Story of the

¹ "Story of the Wheel" by G. M. Boumphrey, published by A. and C. Black, Ltd., London, 1932.

Wheel",¹ wheels, axles, rollers, gears, pinions, rotors, propellers and gyroscopes all stem from the only invention man has ever made all by himself, without cribbing from what is called "nature." This, the only original invention of man, is called the real basis of civilization. The historical angle points to the origin of the wheel, dating somewhere between 25 and 40 thousand years ago, as being the Stone Age solution to doing things the easy way. Boulders could be moved on round pieces of wood that became rollers, then slices of tree trunks and now—all sorts of devices that turn.

This then, is the saga of development in underground haulage, and now we will strive for continuous haulage for continuous mining with continuous wheeling.



Domestic operators hesitated to look for new deposits or put known mines back into operation

Mercury in 1952

**In Spite of High Consumption and Prices Domestic
Production Continued Low**

By S. H. WILLISTON

Vice-President
Cordero Mining Co.

DOMESTIC mercury production in 1952 was somewhat over 12,000 flasks, a considerable increase over the previous year but still far below the normal peacetime levels of the last 100 years.

Consumption, on the other hand, remained high, probably greater than 45,000 flasks and possibly well in excess of that figure. Consumption figures are especially difficult to predict since a very considerable amount of the metal in the hands of producers, dealers and consumers is earmarked for electrolytic plants and installation dates convert overnight a large amount of metal from inventory to consumption.

Expansion of production within the United States has been negligible during the year. Although the price is far above pre-Korean levels, it has only barely regained the cost-price relationship of the late 30's. While prices are almost three times as great as during those years, operating costs have fully matched the increase. If there was any probability that present cost-price relationships would continue, domestic production would probably expand but, in the light

of repeated statements from Washington that the supply-demand picture was comfortable and that there was no need for additional production, domestic operators are extremely hesitant about exploring for new deposits or putting known mines into operation.

Government authorities have apparently continued to favor foreign production rather than domestic and recently refused to permit American producers to even bid on requirements which were subsequently purchased from abroad. The United States is now almost wholly dependent on European supplies and it is very probable that when those suppliers realize their position they will demand a price well above the present market.

Prices Reach Two-Year High

Mercury prices during 1952 started out well above the \$200 level and dropped to the neighborhood of \$185 before resuming the upward climb, closing the year at around \$218—the highest level since January 1951.

The reason for the decline was the

Spanish producer's readoption of the two-price plan based on the "switch pound" which made sales price to the United States consumers approximately equivalent to the European sales price. This is the second time the European producers have adopted a pricing program to absorb the American duties. With the tightening of spot supplies, foreign producers abandoned this policy late in the year with an immediate upward effect on prices.

With the exception of Indian metal, most of the world stocks of spot metal have been consumed, other than the United States Government stockpiles.

Italian producers are sold out for several months to come, the Spanish mines have little or no stocks of uncommitted metals and American, Mexican and Yugoslavian stocks are negligible.

During the year only three mines in the United States consistently produced in excess of 100 bottles a month, and those three mines probably produced over 80 percent of the total domestic output. These are the Sonoma, New Idria and Cordero, the first two in California and the other in Nevada. The next two most important producers were the Bonanza in Oregon and the Hermes in Idaho.

There were several Defense Minerals Exploration Administration exploration projects in operation during the year but to date none have developed anything of importance. It is more than possible that the New Idria project might meet with success in 1953 but none of the other programs show any indication of developments large enough to seriously affect production levels in the coming year.



General Services Administration chromite ore purchasing depot at Grants Pass, Ore. (Courtesy of Glunz Studio, Grants Pass)

Chromite

Current Rate of Domestic Chrome Production About Two Percent of National Consumption

By F. W. LIBBEY

Director,
Oregon Department of Geology and Mineral
Industries

DOMESTIC production of chromite at the start of the Korean war was practically nil (total of 404 tons in 1950, all from California). The current rate of production (a variable that may change from month to month) is estimated to be about 25,000 tons per year, about half from California and half from Oregon. This production rate is about two percent of our present national consumption of chrome ore (about 1,200,000 tons) and about four percent of our requirements for metallurgical grade chrome (about 600,000 tons). When the Montana project of the American Chrome Co. gets into production, scheduled for 1953, the company will produce 900,000 tons of concentrates over an eight-year period. If the emergency is great enough, these concentrates, estimated to contain about 40 percent Cr_2O_3 and $1\frac{1}{2}$ to 1 chrome-iron ratio, could be used in the metallurgical industry without upgrading, according to some sources. However, it appears that the steel industry would balk at using ferrochrome made from this grade of concentrates if there is any way of obtaining standard grade alloying material. It is obvious that more tons of the low-grade concentrates would be required to meet our needs than standard ferrochrome from high-grade ore.

In 1954, if we produce 112,000 tons

of Montana chrome and 50,000 tons of Oregon and California chrome, the domestic production rate would be about 13.5 percent of domestic consumption of total chrome. This estimate makes no allowance for possible production from the Kenai Peninsula, Alaska. A similar estimate may not be made for 1955 since the government program for buying ore at Grants Pass, Ore., is now scheduled to end June 30, 1955.

Buying Program Hindered

The chromite buying program at Grants Pass is gaining momentum much more slowly than had been hoped for. This is partly due to a late spring, result of the heavy snowfall last winter, and partly because of the many natural difficulties in developing and getting out ore in a mountainous country. Access road help is sorely needed. It is well known that chrome ore deposits in Oregon and California are generally undeveloped so that mining is on a hand-to-mouth basis and there are difficulties in planning ahead both because of lack of knowledge of available ore and because of the time limitations in the government program. Weather conditions during winter months sometimes obstruct transportation of ore. There is a shortage of experienced chrome miners. Boom conditions are developing and some of the people who are

prospecting or taking out ore have little real knowledge of mining and milling. Fifteen mills have been, or are being, built in Oregon. Eight of these are producing concentrates. Three mills are shipping concentrates from California. Two small mills at John Day, Ore., are shipping concentrates 390 miles to the Grants Pass depot by a commercial truckline at a cost of \$20 per ton.

Since conditions governing building up of production contain many uncertainties, it is impossible to predict when maximum production may be obtained and to how much it may amount. It seems fairly well assured that more metallurgical grade chrome will be produced than was considered probable by government agencies when the program was set up, and, in attaining this production, more chromite ore including concentrating grade will be found than is mined. It has been estimated that the ore shipped to the Grants Pass depot averages about 47 percent Cr_2O_3 and about 2.7 to 1 chrome-iron ratio.

Need Extension of Time Limit

Probably an effort will be made next year to obtain an extension of the government chrome buying program at Grants Pass together with a liberalization of ore specifications based on the contract with American Chrome Co. This would make available additional ore reserves especially in the John Day area. Also something should be done in the way of a freight differential for John Day ore. If an extension is granted so that miners may make some long-range plans, production will continue to increase. If an extension is not granted, production of Oregon and California ore may begin to fall off in 1954. It is self evident that investment for exploration and treatment plants is precluded by the time limitation of the present program.



When Yellow Pine mine at Stibnite, Idaho, closed down, more than 90 percent of domestic antimony production was cut off

Antimony

Outlook Dim As World Production Remains Low and Inventories Dwindle

By JAMES P. BRADLEY

Vice-President
Bradley Mining Co.

TO understand the events of 1952 as they concern antimony, it is necessary to refer to 1951 when free world mine production of antimony exceeded demand. The overproduction in 1951 was due not only to the high prices which stimulated increased output all over the world, but was also due to the unusually high grade ore mined and milled during the year at the Consolidated Murchison property in the Union of South Africa. During 1951 this one mine produced 17,480 tons of antimony (about 30 percent of the free world output) as compared to 9161 tons in 1950.

High production of 1951 resulted in an accumulation of inventories, the liquidation of which commenced late in 1951 and continued into 1952. By the early part of 1952, the heavy liquidation of foreign inventories had depressed the market below the cost of production of most free world mines. This resulted in drastic curtailment of free world antimony mine production, the shutdown of the principal U. S. producer and the encour-

agement of consumers to live off their inventories in the hopes of further price reductions. U. S. industrial inventories of primary antimony (including ore and concentrate, metal,

oxide, sulfide, residues and slags) totalled 8373 tons at the beginning of 1952, reached a peak of 9536 tons at the end of February and thereafter dropped steadily to 7262 tons at the end of October when they were at the lowest level in the past several years. There are indications that foreign inventories declined even more rapidly than U. S. inventories during 1952.

Consumption Down 10 Percent

On the basis of U. S. Bureau of Mines' statistics for the first ten months of 1952, U. S. consumption of primary antimony during 1952 is estimated at about 10 percent under the 1951 consumption of 17,519 tons. The U. S. supply-demand situation for the

TABLE I

U. S. Primary Antimony Supply and Demand, 1st 10 Months, 1952 (Short tons contained antimony)	
Domestic Mine Production.....	1,932
Net Imports	10,411
Total Supply	12,343
Decline in Industrial Inventories	
January 1, 1952	8,373
October 30, 1952	7,262
Apparent Consumption	13,454

TABLE II

U. S. Prices (Approximate) of Principal Antimony Products During 1952			
	1st of Year	Low	End of Year
Antimony Metal (99.5%), per lb.....	50 cents	28 cents	31 cents
Antimony Oxide, per lb.....	44½ cents	30 cents	30c @ 36c
Chemical Grade Antimony Ore, per contained short ton unit of antimony.....	\$6.75 @ \$7.00	\$3.00	\$3.50 @ \$3.75

TABLE III

U. S. Imports of Primary Antimony, First 10 Months, 1952 (Short tons contained antimony)	
Ore and Concentrate	6,502
Metal	2,985
Oxide	1,073
Sulfide	16
Total Imports	10,576
Exports (First nine months only)	165
Net Imports	10,411

first ten months of 1952 is summarized in Table I.

During the first ten months of 1952, U. S. consumption of primary antimony was approximately 58 percent in nonmetal products and 42 percent in metal products. The largest use of antimony continued to be in the flameproofing field, where antimony oxide is used for imparting flame retardance to paints, plastics and textiles.

Prices of the principal antimony products dropped sharply in early 1952, but started to recover towards the end of the year, as shown in Table II.

Domestic Mine Production

Following the shutdown of the Yellow Pine Mine and Smelter at Stibnite, Idaho, during the summer of 1952 due to the depressed antimony market, domestic mine production of antimony dropped to a negligible level (three tons in September; 16 tons in October). The Yellow Pine property had been producing well over 90 percent of domestic output for many years and has a productive capacity of 4000 tons of antimony annually, equivalent to about 20 percent of U. S. peacetime requirements or 10 percent of wartime requirements.

Plans for resumption of production at the Yellow Pine Mine and Smelter are entirely dependent upon market conditions. The Bradley Mining Co. is making tentative plans to reopen the smelter in the spring of 1953 for the treatment of accumulated in-process materials. This would result in the smelter operating at 25 percent of capacity and it is possible that the additional capacity of the plant may be used for the treatment of custom ores if market conditions are favorable. There are no immediate plans for the reactivation of the mine and mill—such plans will have to wait for a more stable market outlook.

DMEA exploration work is being continued at the Yellow Pine Mine during the period of shutdown.

Source of 1952 Imports

During the first ten months of 1952, net imports of primary antimony in the amount of 10,411 tons were received from 14 countries, including

Belgium-Luxembourg, Bolivia, Canada, Czechoslovakia, France, Greece, Italy, Mexico, Netherlands, Peru, Turkey, Union of South Africa, United Kingdom and Yugoslavia. However, the source of 86 percent of these imports can be traced back to three countries: Bolivia, Mexico and Union of South Africa (in the order of importance). As in previous years, the imports were mainly in the form of duty-free ore and concentrate (see Table III).

Outlook for Future

As mentioned above, there has been a sharp curtailment of mine output in the principal free world producing countries. Due to the delays and difficulties in reactivating closed or curtailed mining properties, the outlook for adequate free world supplies of primary antimony during 1953 is not favorable.

A further production decline can be anticipated in Bolivia (chief source of supply for the U. S. in recent years) due to economic and political troubles in that country. Mexican production

has a declining trend due to the gradual exhaustion of higher grade ore deposits, suitable for hand sorting. Production at the Consolidated Murchison Mine in South Africa varies with the grade of ore mined and it is therefore difficult to predict the amount of antimony that may be available from this source in the future.

U. S. Strategic Stockpile

It has been announced by the government that the stockpile objective on antimony has been completely fulfilled. However, according to industry estimates, the stockpile is dangerously inadequate and contains about 20,000 tons of primary antimony or enough to meet wartime requirements for only six months at the World War II peak rate of annual demand.

In view of the low U. S. self-sufficiency and the deterioration in the free world supply of antimony, members of Congress and members of industry have repeatedly recommended to the various Federal agencies responsible for stockpiling that the antimony stockpile goal should be revised upwards in the interests of national security.

At the present time, the United States is almost completely dependent on far off and uncertain sources for its primary antimony requirements, declining inventories at home and abroad are furnishing a good portion of current supplies, our strategic stockpile is dangerously low and the outlook for adequate future supplies is not favorable.





1953 Coal Show

Plans Well Advanced For Biggest Convention and Exposition Ever

MAY 11-14—those are the dates. Cleveland Public Auditorium—that's the place. The 1953 Coal Show—that's what! Yes, it's once again time to make your plans for attending the coal industry's "Show of Shows."

Groundwork for the Convention sessions was laid last fall when the Program Committee, under the leadership of R. E. Salvati, gathered in Pittsburgh to outline this year's Convention Program. Since then, leaders in the industry have been invited to speak on subjects selected by the Committee. A glance at the preliminary program on the following page will show that the promise of better-than-ever sessions is amply fulfilled.

Coal mining is undergoing a major transition. This might not be evident to those who are in the midst of the transition, but a review of Coal Convention Programs over the past several years makes this fact stand out. Practices and equipment radically new a few years ago are now accepted as commonplace. This is, of course, as it should be, and the American Mining Congress is proud that its Coal Conventions and Expositions have done much to spark these advances.

Enough of the spectacular. Any mine operator knows that it is often the small refinements that make the difference between a losing and a paying operation. Latest wrinkles in making a mine more efficient, safer or more profitable will be discussed by the men who are responsible for developing these aids to operation. Topics for discussion have been se-

lected so that all, from the machine operator to the company president, will find something of interest and value at every meeting.

All who attended the 1951 Coal Show remember it as the greatest one ever. Until then, that is. This May there will be more exhibitors, more space has been taken and more people promise to attend than ever before. Exhibiting manufacturers—over 230 of them—have been planning for months to make their displays more valuable to mining men. There will be trained representatives on duty at all times to explain the "ins and outs" of each piece of equipment and to answer questions. Here is an opportunity to see all makes and all types of mining machinery, supplies, tools and accessories at one time. An opportunity to observe and compare. An opportunity to see what is ahead.

Full Days and Gala Evenings

While the Convention and Exposition will fill the daylight hours of the week, the evening hours will also be full. In addition to the stimulating round of visiting, making new friends and renewing old acquaintanceships, an outstanding entertainment program has been announced. On Monday night a baseball game will be played between the Cleveland Indians and the Chicago White Sox. Two large blocks of seats, along the first base and third base lines, have been reserved for coal miners and their friends. Order blanks for these tickets will soon be in the mail. All base-

ball fans should plan to attend with their friends in the mining fraternity.

The Coal Miners Party has been scheduled for Tuesday night. Dinner, dancing and entertainment will be enjoyed by all who attend this memorable affair. Advance interest indicates that this will be an exceptionally well attended event. To insure enough space, the party will be held in three downtown hotels. All mining men should resolve to bring their ladies and attend this gala function.

Wednesday night will be open to allow time to sit around the cracker barrel for an old fashioned visit. The grand social function of the week will be the big show on Thursday night. Scheduled to be held at the Music Hall in the Public Auditorium, the program will be one of the kind that has so delighted Convention-goers at the Coal Show in previous years. This will be a fitting climax to a most memorable week.

Ladies are cordially invited to come to Cleveland with their men. A special program is being worked out for their entertainment during the day. They are urged to come to the Exposition also—to see the machines and equipment used to mine and prepare coal.

Applications for advance registration will be in the mail soon. Those who plan to attend should be sure to fill these out and return them immediately, thus saving precious time at Cleveland.

Housing is again being handled by the Cleveland Housing Bureau. Requests for accommodations should be sent immediately to Miss Louise D. Perkins, Director, Housing Bureau, 511 Terminal Tower, Cleveland, Ohio. Those driving to the Show should not overlook the possibility of staying at one of the excellent motels surrounding Cleveland. The Bureau has advised that it can house all who attend, so plan now to be at the 1953 COAL SHOW.

Preliminary Program

MONDAY, MAY 11

10:00 am—Opening Session Roof Support and Pillar Recovery

- A Summary of Roof Bolting Developments
H. E. KNIGHT, *Bell & Zoller Coal & Mining Co.*
J. C. HUNTER, *Powellton Coal Co.*
E. R. COOPER, *Jones & Laughlin Steel Corp.*

- Pillar Extraction Under Heavy Cover
R. F. BOWIE, *Union Pacific Coal Co.*

- Pillar Extraction in Anthracite Mining
ROBERT VON STORCH, *Hudson Coal Co.*

2:00 pm—Manufacturers Division Meeting

TUESDAY, MAY 12

10:00 am—Mechanical Mining Session

- Maximum Extraction in First Mining
MACK H. SHUMATE, *Truax-Traer Coal Co.*

- Mechanical Mining in Thin Seams
W. J. SHIELDS, *Rochester & Pittsburgh Coal Co.*
FRANK BADDA, *Northwestern Improvement Co.*

- Specifications for Efficient Face Preparation
EMMETT T. LANG, *Powhatan Mining Co.*

10:00 am—Safety Session

- Degasification of Coal Seams—A Progress Report
G. R. SPINDLER, *West Virginia University*

- Coal Dust Sources and Control Underground
JAMES WESTFIELD, *U. S. Bureau of Mines*

- Coal Mine Bumps—Causes and Prevention
CHARLES T. HOLLAND, *Virginia Polytechnic Institute*

2:00 pm—Strip Mining Session

- Coal and Overburden Haulage—A Panel Discussion
FRANCIS W. CHESNEY, *Shen-Penn Production Co., Chairman*

- E. E. HOWARD, *Caterpillar Tractor Co.*
R. C. GESSEL, *R. G. LeTourneau, Inc.*
A. S. MCCLIMON, *Euclid Road Machinery Co.*
Others Speakers to be Announced.

- Bucket and Dipper Trends—A Panel Discussion
JAMES D. REILLY, *Hanna Coal Co., Chairman*
C. J. POLINEK, *Page Engineering Co.*
KARL SCHNEIDER, *Harnischfeger Corp.*
R. M. DICKEY, *Bucyrus-Erie Co.*
A. F. BUSIC, *Marion Power Shovel Co.*

WEDNESDAY, MAY 13

10:00 am—Management Session

- Fifty Years of Handling Labor Disputes
DR. E. LARKIN, *Anthracite Board of Conciliation*

- Central Management vs. Unit Supervisory Control
PAUL WEIR, *The Paul Weir Co.*

Stream Sanitation Problems in the Ohio River Valley

- A Panel Discussion by members of the Coal Industry Advisory Committee

- E. R. PRICE (*Chairman*), *Inland Steel Co.*
H. B. HEBLEY (*Secretary*), *Pittsburgh Consolidation Coal Co.*
JAMES HYSLOP, *Hanna Coal Co.*
J. J. FOSTER, *Island Creek Coal Co.*
T. J. HOFFMAN, *West Kentucky Coal Co.*
L. E. SAWYER, *Indiana Coal Producers Assn.*
W. L. MCMORRIS, *Coal Div. U. S. Steel Corp.*

10:00 am—Haulage and Power Session

- High Capacity Track Haulage
D. H. DAVIS, *Mathies Coal Co.*
REPRESENTATIVE OF *Snow Hill Corp.*

- A Complete Belt Mine
REPRESENTATIVE OF *Peabody Coal Co.*

- Reversed Polarity for Mine Circuits
H. B. BUCKINGHAM, *Tenn. Coal & Iron Div., U. S. Steel Corp.*

2:00 pm—Strip Mining Session

Highwall Drilling—A Symposium

- General Problems
FRED HORNE, *Sinclair Coal Co.*

- Horizontal Drilling
MARLIN CARTER, *Ayrshire Collieries Co.*

- Vertical Drilling
ROBERT AKKE, *Maumee Collieries Co.*
G. H. UTTERBACK, *United Electric Coal Cos.*

THURSDAY, MAY 14

10:00 am—Continuous Mining Session

- A Review and Forecast of Continuous Mining
M. H. FORESTER, *Pittsburgh Consolidation Coal Co.*

- Continuous Transportation Methods and Equipment
JAMES D. SUTTON, *Clearfield Bituminous Coal Corp.*
W. B. JAMISON, *Jamison Coal & Coke Co.*
Others Speakers to be Announced.

- Remotely Controlled Bore Mining
P. L. ALSPAUGH, *Carbide & Carbon Chemicals Corp.*

10:00 am—Coal Preparation Session

- Underground Operations that Affect Coal Preparation
R. L. LLEWELLYN, *Eastern Gas & Fuel Associates*

- Anthracite Fine Coal Cleaning at Coaldale Plant
W. T. TURRELL, *Lehigh Navigation Coal Co.*

- Bituminous Fine Coal Cleaning in West Virginia
MATHEW TURKOVICH, *Island Creek Coal Co.*

- Coal Preparation with New Type Heavy Media Operation
J. B. TAGGART, *Wise Coal & Coke Co.*

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Wheels of GOVERNMENT



As Viewed by HARRY L. MOFFETT of the American Mining Congress

THE reins of the Nation's Government shifted to a new party for the first time in 20 years when Dwight David Eisenhower, on January 20, took the oath of office as the thirty-fourth President of the United States.

In repeating the time-honored words accepting the responsibility for faithfully executing the office of President and upholding the Constitution of the United States, Eisenhower was capping a brilliant career as a soldier, educator and statesman.

The first action he took was to speed the nominations of his Cabinet to the Capitol, where quick approval was given by the Senate except in the case of Secretary of Defense Charles E. Wilson, who was required to divest himself of stock holdings before the upper chamber confirmed him in the post. The other members of the Cabinet are: John Foster Dulles, Secretary of State; George M. Humphrey, Secretary of Treasury; Herbert Brownell, Attorney General; Arthur E. Summerfield, Postmaster General; Douglas McKay, Secretary of Interior; Ezra T. Benson, Secretary of Agriculture; Sinclair Weeks, Secretary of Commerce; and Martin P. Durkin, Secretary of Labor.

The influx of new Cabinet officers and responsible administrative officials in the various departments and agencies of the Government is expected to be a prelude to many reorganizations in the Executive Branch with the aim of increasing efficiency and effecting economies. Elected on the promise to "clean house," it is apparent that the new Administration will drive hard to fulfill that promise.

On the legislative front, the 83rd Congress completed its organization and awaited the State of the Union Message from President Eisenhower before throwing the law-making machinery into high gear.

Meanwhile President Truman, before leaving office, sent Congress three messages—the first proposing a budget of \$78.6 billion for the coming

fiscal year; the second being his last State of the Union epistle in which he reviewed the years of his Administration but made no legislative recommendations; and the third, his last Economic report, which declared the nation to be in robust economic health and called for adoption of major economic controls and continued foreign aid.

Tidelands Battle Shaping

In his last major official act, Mr. Truman signed an executive order transferring Federal jurisdiction over the controversial off-shore tidelands to the Navy Department. This action aroused a storm of protest on Capitol Hill, particularly from proponents of State ownership of the tidelands. It is likely that President Eisenhower will rescind the order.

Meanwhile, many bills have been thrown into the legislative hopper on both sides of the Capitol calling for return of the tidelands to State control. Federal ownership proponents have likewise advanced proposals to confirm title to the submerged lands in the national Government. A battle over the tidelands is shaping up with both sides girding for the fray. In the end, most observers deem it probable that the States will triumph and that the President will sign control over to them.

Copper Duty Suspension Continued

The first bill to receive formal consideration in the 83rd Congress was H. R. 568, sponsored by Chairman Reed (Rep., N. Y.) of the House Ways and Means Committee, which calls for a continued suspension of the 2 cents a lb import duty on copper through June 30, 1954. Under present law the suspension would have terminated February 15, 1953. The Reed bill was approved by the Committee without formal hearings and sent to the House floor, where it was quickly passed. In the Senate it has been referred to

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Washington Highlights

NEW ADMINISTRATION: Took over January 20.

TIDELANDS: Control to States?

COPPER: Duty Suspension Continued.

TAFT-HARTLEY: Revision in the Making.

TAX: Reduction Sought.

REORGANIZATION: Authority Extended.

ST. LAWRENCE: Seaway Authorization Possible.

STOCKPILING: Investigation Scheduled.

CONTROLS: Outlook Clouded.

★ ★ ★ ★ ★ ★ ★

the Finance Committee, and prompt approval in the upper chamber is expected.

As passed by the House, the measure makes no change in the existing law except as to the expiration date. Thus the law would still require that the duty be restored by the President when the price of electrolytic copper falls below 24 cents a lb for any calendar month.

Taft-Hartley Hearings Slated

Both Houses of Congress plan early hearings on revision of the Taft-Hartley Act. Hearings before the House Committee on Education and Labor are likely to get under way by mid-February, with representatives of Government, industry, labor and others being asked to set forth their views on all provisions of the existing law. Chairman McConnell (Rep., Pa.) has stated that he does not wish to limit the scope of the hearings solely to measures which have been introduced in the House and referred to the Labor Committee, but prefers to hold hearings on the entire law lasting several weeks, and then write a bill covering the major revisions believed to be needed as a result of the views advanced.

Across the Capitol, the Senate Labor and Public Welfare Committee plans to open hearings late in February. Chairman Smith (Rep., N. J.) has declared that he believes agreement can be reached between management and labor on some amendments without extensive hearings. Senator Taft, a member of the committee and head of its labor-management subcommittee, however, has expressed the view that this procedure will not be successful, and would only result in a flood of amendments having to be considered on the Senate floor.

Taft has introduced a number of proposed amendments to the law, none of which would affect industry-wide bargaining. Among the major changes he proposed are: extension of the requirement for filing non-communist affidavits, now applying only to union officials, to employers; increasing the size of the NLRB from the present five to seven members; authorizing strikers who have been permanently replaced to vote in elections growing out of a labor dispute; and simplifying the process for certifying building trades unions as bargaining agents.

In view of the lengthy consideration to be given proposed revision of the law, it is not likely that specific bills will be brought to floor debate before early spring.

Tax Reductions Sought

On the tax front, a cautious approach as to lowering individual income tax rates and abolishing the excess profits tax is being taken by the new Administration. A "wait and see" attitude is paramount in the thinking of leaders in the Administration. "Wait" until the budget for the fiscal year 1954 takes shape and then "see" where taxes can be pared, is their philosophy.

Meanwhile, Chairman Reed of the House Ways and Means Committee has introduced a measure designed to accelerate by six months the automatic 11 percent cut in individual tax rates which is scheduled to take place on January 1, 1954. His bill would reduce individual taxes for the calendar year 1953 by approximately 5½ percent for the lower brackets, ranging down to about one-half of 1 percent for the highest brackets. Revenue loss from these cuts has been estimated at about \$1½ billion for 1953 and double that in 1954. He expects the bill to be approved by the Ways and Means Committee on February 16 and will push for quick floor action thereafter.

Reed also announced that he favored letting the excess profits tax expire as scheduled on June 30, 1954, a view which is shared not only by many

members of Congress but also by high Cabinet officials.

Meanwhile, the staff of the Congressional Joint Committee on Internal Revenue is continuing its studies of the tax laws with a view towards holding hearings, probably this spring, on a general overhauling of the tax structure.

Reorganization Proposals Advanced

Both the Senate and House Government Operations Committees have approved measures to extend for two years existing authority for the President to reorganize Government departments and agencies. In approving the measures, the committees wrote into the bills an amendment providing that any plan proposed by the President may be vetoed by either house of Congress within 60 days of its submission, by a mere majority vote.

The present law requires a "Constitutional majority" of either House to reject a reorganization proposal; in other words, a majority of the total number of members rather than of those present when the matter is considered.

Present reorganization authority would expire April 1, 1953. It is known that President Eisenhower leans towards the adoption of many of the plans offered by the Hoover Commission for reorganizing the Executive arm of the Government, and that he has had a special group busy studying changes believed to be necessary in the interest of eliminating overlapping in functions between various agencies and reducing the size of the vast bureaucratic empire.

St. Lawrence Seaway Outlook

For the first time in more than a score of years, there appears to be a strong prospect for Congressional authorization of the much-debated St. Lawrence Seaway. A host of measures have been introduced in both Houses of Congress calling for U. S. participation with Canada in the development of the Seaway.

Most likely proposal to be adopted is one which would establish a St. Lawrence Seaway Development Corporation for the sole purpose of building that part of the project which is at the International Rapids Section on the U. S. side. The corporation would be financed through the issuance of self-liquidating bonds and would have nothing to do with the power phase of the project. The latter would be built jointly by Ontario and New York State.

Reason for the improved outlook this year for proponents of the Seaway is the great amount of support evidenced in the 83rd Congress and

the determined drive that is likely to be made by the Eisenhower Administration for its authorization.

To Investigate Stockpiling

The Senate Government Operations Committee, which is responsible for delving into the multitudinous operations of the far-flung agencies and bureaus of the Federal Government, is planning a number of investigations into the conduct and administration of programs authorized by Congress. Foremost among the programs to be investigated is that involving the stockpiling of strategic and critical materials.

Chairman McCarthy (Rep., Wis.) of the committee has announced that committee aides are thoroughly reviewing the stockpiling program of the past few years, and have uncovered evidences that the administration of it has been costly and wasteful. Early hearings are planned with stockpiling officials likely to be called as the first witnesses.

The committee also plans to look carefully into the operations of the General Services Administration.

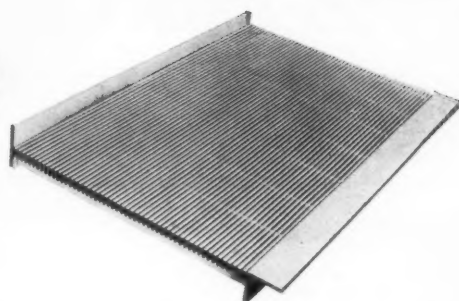
What Future For Controls?

The knotty problem of what to do about continuing economic controls is up to Congress to decide. Most controls expire early this year and as yet no hearings have been held to sound out public sentiment as to their future.

An increasing chorus declares that controls over prices, wages, salaries, and even materials should be eliminated and that the nation should revert to a free, competitive market. Congressional sentiment, while not yet jelled, seems to be heading towards continuation of some form of controls over materials—allocations and priorities—continued power to expand production, particularly in the natural resources industries, and authority for making loans to industry. Likewise, it is expected that some credit and rent controls will be continued. As to price and wage controls, the future is in doubt. A possible law providing standby authority may be in the making.

Meanwhile, the control agencies are rapidly "rolling up" their operations. NPA is cutting its staff drastically as materials become less scarce, and has gone so far as to state that CMP may be done away with, except for the military, by April 1. OPS is rapidly becoming a skeleton agency. The Wage Stabilization Board is a mere shadow of its former self and administration of its powers is sadly lacking. It is probable that the Administration is giving careful study to revamping the entire controls set-up so as to achieve a more unified handling of the remaining powers.

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- COAL** is the safest fuel to store and use.
- COAL** is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

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Personals

Louis Buchman retired on January 1 from his position as vice-president and director of Kennecott Copper Corp. and general manager of its mining operations in the United States.



Louis Buchman

Buchman had served for nearly 39 years in various capacities for Kennecott. A graduate of the Michigan College of Mines in 1907, he began work at the old Utah Copper Co. as an assayer in 1914. He was serving as general superintendent of mines when the company became the Utah Copper Division of Kennecott. E. W. Engelmann also retired on January 1. He was assistant general manager of Utah Copper Division of Kennecott. He has been with the corporation and its predecessors since 1911.

Stuyvesant Peabody, Jr., president of the Peabody Coal Co., has announced the retirement because of ill health of John L. Pieroni, assistant vice-president. At the same time it was announced that Glenn M. Schaeffer will be named vice-president in charge of sales and traffic and that Frank J. Hoyne, assistant vice-president, will become sales manager.

Staff changes have been announced by Combined Metals Reduction Co. at its allied Pioche Manganese Co. Max J. Kennard, formerly chief engineer of all Combined Metals operations has been named general manager of firm. K. K. Hood, of the engineering staff and former manager of Callahan Zinc-Lead Co. has been appointed Kennard's successor. R. W. Lottridge, formerly general superintendent for the Federal Mining and Smelting Co. in Idaho has been named manager of the Henderson plant. F. R. Leonard, former metallurgist at the Murray Smelter of American Smelting & Refining Co., will be metallurgical assistant to Mr. Kennard. Other appointments include F. B. Peterman who will be assistant plant manager;

J. T. Crawford becomes office manager; Frank P. Souders, formerly general superintendent of the Bradley antimony plant at Stibnite, Idaho, will be plant superintendent; L. J. Hartzell, chief chemist and Ray E. Kirk, master mechanic all at the Henderson Plant.

Dick Ludwig, who has been a mechanical engineer for the United States Fuel Co. since March 1, 1951, has been transferred to the company's Alaskan operations, where he will be plant engineer.

Magma Copper Company announced the following appointments, effective January 1.

Frank G. Sarver, purchasing agent, to assistant to the vice-president and general manager of Magma Copper Co. and San Manuel Copper Corp.; C. B. Foraker, acting mine superintendent, to mine superintendent; R. L. Medlock, assistant purchasing agent, to purchasing agent; T. P. Trask, assistant chief electrician, to chief electrician, and Elmer Mathews to chief electrical foreman.

D. W. Buchanan, Jr., president of the Old Ben Coal Corp., has announced several changes in the operating management which became effective January 1.

Roy L. Adams, vice-president in charge of operations; Ed R. Lutz, above ground superintendent of plants; and John E. Jones, safety engineer asked to be relieved of daily responsibility. The three men will remain with the company on a consulting basis. Howard Lewis was elected vice-president in charge of operations to succeed Adams. J. W. MacDonald was elected vice-president in charge of engineering, and George Strunck was promoted to superintendent of plants in place of Lutz. William C. Campbell was assigned as assistant to Lewis. William H. Bailey was designated superintendent of Mines 11, 14, and 22, and Joseph Littlefair is now superintendent of Mines 9 and 15.



Roy L. Adams

The appointment of Earl R. Bryant as technical service director of Universal Atlas Cement Co., succeeding Homer G. Farmer, who retired December 31 after 41 years of service with the company, was announced by Fred T. Wiggins, vice-president and general sales manager of this U. S. Steel subsidiary.

J. Fred Johnson, manager of operations, Western Mining Dept., American Smelting & Refining Co., retired on January 1. However, he will continue as a consultant for the firm. Appointed to succeed him is F. V. Richard, former manager of the Southwest Division of the Western Mining Dept. of AS&R.

John E. Dodson, vice-president of Weston Dodson and Co., has been elected to the Board of Directors of Lehigh Navigation Coal Co., according to Evan Evans, Old Company president.

In 1939, after four years in the domestic, industrial and commercial stoker business, Dodson joined Weston Dodson and Co. as sales representative in the New England territory. In 1942 he was commissioned in the U. S. Naval Reserve and was returned to inactive status September, 1945, rejoining Weston Dodson in charge of the New Haven and Norwalk, Conn., retail fuel and building materials business. He has been in Bethlehem since 1947, assisting in the administration of Dodson's producing company.



John E. Dodson

Early in January, a party of four geologists of Behre Dolbear & Co. left New York for the Galapagos Islands to make a geological reconnaissance of Isabela Island. The party includes Dr. Chas. H. Behre, Jr., Dr. A. F. Banfield, David St. Clair and Captain Guillermo Bixby.

Robert H. Hughes has been elected president and a director of Clinchfield Coal Corp. Since November 1, 1951, he had been serving as vice-president in charge of operations for the company. J. P. Routh, chairman of the board and president of the Pittston Co., and chairman of the board of Clinchfield, resigned as president of Clinchfield in favor of Hughes. At the same time C. Kyle Tieche was elected a vice-president of the coal company. Tieche has been with Clinchfield since 1947 and at the time of his recent promotion was general superintendent of the company's Virginia operations.

Joseph Kristoff, Jr., has recently been promoted from assistant foreman to night boss at the Westland mine of Pittsburgh Coal Co.

On December 31, **William J. Clements** of Coaldale, Pa., was appointed secretary of mines of the Commonwealth of Pennsylvania by Governor John S. Fine. Clements had been deputy secretary of mines in charge of the Anthracite Division since last September, following the death of Mr. Joseph J. Walsh. He succeeds **Richard Maize**, who was appointed secretary of mines in 1940 by Governor Arthur H. James. Maize will open a consulting business in Uniontown, Pa.

Appointment of **J. P. Caulfield** as general manager, Western Mining Divisions, Kennecott Copper Corp., has been announced by Frank R. Milliken, vice-president in charge of mining operations. Caulfield, with headquarters in Salt Lake City, will supervise Kennecott's operating properties in Utah, Nevada, Arizona and New Mexico. He succeeds **Louis Buchman**, who retired from active service January 1, 1953.



J. P. Caulfield

A native of Butte, Mont., Caulfield spent much of his early life in Utah. He was graduated from the University of Utah in 1923 with Bachelor of Science degrees in Mining Engineering and in Mechanical Engineering. In 1930 the University awarded him the degree of Engineer of Mines. Shortly after graduation in 1923, Caulfield became associated with the H. P. Whitney Enterprises, a relationship that continued until he joined the Kennecott organization in February, 1951, as general manager of the Utah Copper Division.

James W. Morgan, president of Ayrshire Collieries Corp., has announced the election of **Robert K. Beacham** as vice-president of operations for that company. Beacham has been associated with Ayrshire and its predecessors since 1929. Until the current promotion, he had been general manager.

Raymond F. Robinson, chief geologist for Sunshine Mining Co. for the past five years, left that position on February 1 to join the staff of the United States Geological Survey. He was with Federal Mining & Smelting Co. before joining Sunshine in October, 1947.

W. J. Jenkins passed away on January 12, 1953. He would have been 80 years old on February 5. Mr. Jenkins was president of the Consolidated Coal Co. of St. Louis, Mo., for many years, until its sale to Zeigler Coal & Coke Co. in 1951. He had long been recognized as one of the foremost proponents of mine mechanization. Many of the practices which are today considered commonplace were first introduced in mines under Mr. Jenkins' control. A leader in industry, he was also a director and vice-president of the American Mining Congress. He was elected a director in December, 1929; elected to the Executive Committee in December, 1934; and vice-president in December, 1949.



W. J. Jenkins

Verne R. Ekins, 59, president of the Flat Top Mining Co., died of a heart ailment in Salt Lake City on December 27.

Andrew Jackson May, 64, well-known mining engineer, died in Kentfield, Calif., on December 29, following a long illness. Born in Tazewell, Va., he served in various supervisory capacities all over this country and in Australia.

James H. Rose, 69, died at his home in San Diego, Calif., November 28. He was formerly superintendent of the smelter for Magma Copper Co., Superior, Ariz., a position he held for 28 years.

Herbert E. Sawyer, a director of Macwhyte Co., manufacturers of wire rope at Kenosha, Wis., passed away at his home in Hollywood, Fla., December 28, 1952.

He was born at Boston, Mass., October 6, 1878. He joined Macwhyte Co. as treasurer on July 17, 1922. Mr. Sawyer was affiliated with Macwhyte Co. for more than 30 years and recently retired from active management as vice-president and treasurer.

D. E. Renshaw's many friends and acquaintances were shocked at the report of his untimely death in Turkey in late December. His body was brought back to Pittsburgh where funeral services were held on January 11. Mr. Renshaw was in the employ of the Paul Weir Co. at the time of his death, having come with that company a few years ago from Westinghouse Electric Corp. He had been active for

many years in the Power Committee of the American Mining Congress' Coal Division and had written several reports for that committee. Mr. Renshaw was well known in the industry as an expert electrical engineer.

William B. Reed, 78, retired cost accountant, died December 28 in Bethesda, Md. Mr. Reed, a native of Delmont, Pa., joined the Pittsburgh Coal Co. in 1889. In 1911 he went with The New River Co. as an accountant. In 1933 he represented the Smokeless and Appalachian Coal Association in discussions with the National Recovery Administration. From 1917 until 1947, Mr. Reed took part in governmental activities in connection with bituminous coal, either on the part of industry or Government. He received the Meritorious Service Award of the Department of the Interior in 1949. He was the author of "Bituminous Coal Mine Cost Accounting," published in 1922.

Franklin E. Turton, vice-president and director of Braden Copper Co., a subsidiary of Kennecott Copper Corp., died December 21 at his home in Coya, Chile. Mr. Turton had been a resident of Chile and an employee of Braden for 39 years. During the past eight years he was the top official of the company in Chile.

Mr. Turton started with the Braden

company as a young mining engineer and after progressing through various departments, was named assistant manager in 1930. On June 1, 1944, he was named the general manager and on November 1, 1951, was elected a vice-president of Braden. He had been a director of Braden Copper Co. since 1946.

In 1950, the government of Chile bestowed on Mr. Turton one of the highest ranks of the Order of Merit in recognition of his friendship for the people of Chile and for his accomplishments in the management of one of its principal industries.

On December 18, **H. A. Glover**, 67, former president of the Island Creek Coal Sales Co., passed away at his home in Albuquerque, N. Mex. At the time of his retirement in June, 1951, Mr. Glover was director of the Pond Creek Pocahontas Co., Island Creek Coal Co. and Appalachian Coals, in addition to heading the Island Creek Coal Sales Co.



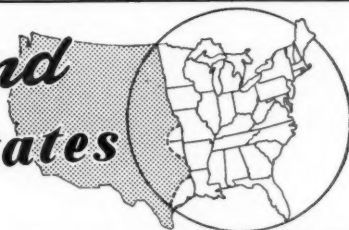
Franklin E. Turton

NEWS

and VIEWS



Eastern and Central states



Sink Two Shafts for Peabody

The Contracting Division of Dravo Corp., Pittsburgh, has started construction of two shafts for the new Mine No. 11 of Peabody Coal Co. near Taylorville, Ill.

One of the shafts, to be used for hoisting coal, will be 558 ft deep and 20 ft in diameter. The other shaft, for men, materials and air, will be 474 ft deep and 24 ft in diameter. Both are to be concrete-lined.

Because the top 92 ft of the shafts have to be sunk through waterbearing earth, Dravo will use concrete caissons for this portion of the project.

It Pays to Be Safe

Pittsburgh Coal Co., Division of Pittsburgh Consolidation Coal Co., distributed more than 22 tons of turkeys as Christmas presents to some 3800 coal miners in its employ. These turkeys, averaging 11½ lb apiece, were given to each employee who had had an accident-free year and was employed at a mine that met the minimum safety requirements.

Study Tennessee Shale

The University of Tennessee has been awarded a research contract by the Atomic Energy Commission to continue and enlarge its studies of Tennessee's Chattanooga shale formation. The new contract covers exten-

sive field studies in the eastern highland rim area, sampling, strata measurements, some detailed mapping and chemical assays. According to Dr. Paris B. Stockdale, head of the University's Department of Geology and Geography and project director, "it has been long known that the Chattanooga shale formation contains traces of uranium in excess of that found in other sedimentary rocks. We're studying the source and manner of origin of this shale and the relationships between its strata."

Education Committee Meets

A regular meeting of the National Coal Association Education Committee was held at the University of Kentucky, Lexington, Ky., Friday, January 16.

Following the opening luncheon, members of the committee made a short tour of the campus, visiting the coal carbonization laboratory and the laboratory in which coal preparation and ore dressing equipment were used for instruction in those subjects. Then a conference was held in the Dean's office with Professor C. S. Crouse, head, department of Mining and Metallurgical Engineering, presiding.

In the evening at dinner in the Student Union, Henry C. Woods, chairman of the Education Committee, presided and introduced the president of the University, Dr. Herman Lee Donovan, who gave a most interesting address entitled, "Highlights in

the History of the University of Kentucky."

On Saturday morning, the Committee held a business meeting when Henry C. Woods again presided. He opened the meeting by describing the Illinois Plan for a course for Coal Salesmen which was not adopted because of the length of time required for its completion.

The Committee will hold its next meeting at Lehigh University, Bethlehem, Pa., on Friday and Saturday, May 15 and 16, 1953.

New Portal for Dun Glen

After 16 years of using the same entrance and the same portal buildings at Dun Glen No. 11 mine of the Hanna Coal Co. Division of Pittsburgh Consolidation Coal Co., a new portal is nearing completion. The new entrance, located on a county road between Route 150 and Harrisville, Ohio, is about six miles from the old portal. It was used for the first time on November 10, and is only 3000 ft from the closest underground working place. Coal, however, is still hauled through the old portal.

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Kentucky Zinc Mine Closes

Production of zinc ore concentrates at the Hutson Mine of Alcoa Mining Co. near Salem, Ky., was suspended until further notice on January 15, 1953, it was announced by the Alcoa Mining Co. in Pittsburgh.

Present prices for zinc ore concentrates are so low, the company said, that operations at the Hutson Mines are no longer profitable.

The company also stated that every effort will be made, within practical limitations, to absorb as many as possible of the approximately 70 employees affected by the shut down into the fluorspar operations of the company in the same general area.

Reserve Mining Gets Loan

A \$148,000,000 mortgage, one of the largest private transactions of its kind ever negotiated in this country, has been placed on file by Reserve Mining Co. of Cleveland.

The loan will be used to finance opening phases of Reserve's taconite program in the Lake Superior District.

Plans call for completion of construction in 1955, with the first operation either late in that year or early in 1956. Ore will come from Reserve's mining property in Babbitt, Minn., by way of a 47-mile railroad to the plant,



As panel chairman, Howard I. Young of St. Louis, president of the American Zinc, Lead and Smelting Co. and the American Mining Congress, keyed a discussion recently before the new Industrial Science Section of the American Association for the Advancement of Science, holding its annual meeting in St. Louis. The Industrial Science Section aims at freer interchange of ideas between those engaged in theoretical science and education on one hand and industrial science on the other. Members of the panel are, from left: F. J. Cornwell, Brown Shoe Co., St. Louis; Harrison A. Roddick, McKinsey and Co., Chicago; Mr. Young; Dr. Frank C. Croxton, assistant director, Battelle Memorial Institute, Columbus, Ohio; and F. V. Hartman, Aluminum Ore Co., East St. Louis

which will be located on the north shore of Lake Superior at Beaver Bay.

The first phase of the program is a 2,500,000 ton per year plan. Later this capacity will be enlarged to 10,000,000 tons per year.

Close Coal Mines

The Locust Coal Co. of Bethlehem, Pa., has closed down the Packer 2, 3, and 4, and the Weston breaker because of high operating and royalty costs.

Release Gas Storage Report

More than two-thirds of all the fields used for storing natural gas underground in the United States are in the Appalachian region, according to a report released today by the Bureau of Mines, U. S. Department of the Interior. The combined capacity of 101 fields in this area exceeds 526 billion cu ft. The practice of underground storage began in 1915, growing into major proportions only in the past 12 years.

Factors involved in selecting and developing storage fields are described in the report. Many of the projects utilize old natural-gas fields that were abandoned when their naturally-occurring reserves of gas became exhausted. The primary consideration of any storage field is that it must be gas-tight.

Prepared by two Bureau petroleum engineers, Henry P. Wheeler, Jr., stationed in Washington, D. C., and William E. Eckard, Franklin, Pa., the report takes into account the co-existence of coal-mining and natural gas storage in the Appalachian region. It is supplemented with several charts and diagrams.

A free copy of "Information Circular 7654—Underground Storage of Natural Gas in Coal-Mining Areas," can be obtained from Publications-Distribution Section, Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa.

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Wins New Scholarship

A World War II veteran and former coal miner is the first winner of the graduate fellowship in anthracite mining which has been newly established at Pennsylvania State College by the Lehigh Navigation Coal Co. He is Samuel W. Llewellyn, 124 W. White Street, Summit Hill, Pa., who served three years in the U. S. Army Air Forces, and worked 2½ years as a contract miner at Lansford Colliery following his graduation from Penn State in 1950, where he majored in mining engineering.

"This fellowship has as its objective the aiding and encouragement of worthy and outstanding young men in pursuing graduate studies in the field of anthracite mining, and in developing new knowledge for the anthracite industry," said the company's general manager, W. J. Parton.

The fellowship agreement between the Old Company and Pennsylvania State College provides an annual grant for the tuition, travel, laboratory fees, special equipment and materials, and other expenses necessary for the graduate studies.

Candidates for the fellowship may be graduates of any accredited college or university. The recipient of the fellowship is chosen by the Chief of

ALBERT W. DICKINSON after 24 years of serving the mining industry with the American Mining Congress has decided to devote more of his time to fishing and other outdoor activities. As a graduate of the Michigan School of Mines he found early employment in the Michigan copper country and zinc mines in Wisconsin. Following this, Bert Dickinson had a long and interesting career in coal mine operation and management in the central and western states.

He was general superintendent of the Missouri Pacific Railroad Coal Properties and later served as general superintendent of the Union Pacific Coal Co. He was also valuation engineer in the Bureau of Internal Revenue and brought all his wide experience to bear on his legislative and economic work with the American Mining Congress. An intimate knowledge of the Washington scene was reflected in "Wheels of Government" which he has contributed monthly to Mining Congress Journal.

His sage advice, courtly charm and never-failing good humor will be missed, but his long years of service to mining have certainly earned him every right to a long and happy retirement.

Good fishing, Bert.



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the Division of Mining, Pennsylvania State College, in consultation with other members of his staff and with the approval of the company.

"We are very hopeful that the fellowship will show the way to deserving students who want to specialize in anthracite mining engineering, and to get for our company and industry the benefits of their research on behalf of anthracite," Mr. Parton said. Applicants for the fellowship are invited to contact Pennsylvania State College or the Lehigh Navigation Coal Co.

Kentucky Mine Burns

The Harlan Imperial Coal Co. of Harlan, Ky., suffered a fire in late November.

The company has been operated since September 1 by Lewis Green and E. M. Howard, Jr.

Jewell Ridge Acquires Hutchinson

The Jewell Ridge Coal Corp., Tazewell, Va., announces the purchase of the Hutchinson Coal Co. of Fairmont, W. Va., which operates three mines in the Logan field.

General sales and operating offices will be moved immediately from Fairmont to Tazewell. There will be no interruption in the operation of the mines.

New officers of Hutchinson Coal are Huston St. Clair, president; C. E. Walker, executive vice-president; and R. R. Bunton, secretary-treasurer.

Maine Manganese Report

A 28-month exploration project carried on by the U. S. Bureau of Mines, disclosed an estimated 256,000,000 tons of ore averaging 8.9 percent manganese in a wooded area between 9 and 10 miles west of Bridgewater, Me., in central Aroostook County. Included is an estimated 121,000,000 tons averaging 11.2 percent manganese.

Ores containing at least 48 percent manganese are usually used for the production of ferromanganese, into which most commercial ore is converted. Tests conducted by the Bureau showed that while the central Maine ores cannot be concentrated by conventional ore-dressing methods, much of the contained manganese can be recovered by metallurgical treatment. However, it would require a lower-cost process than any yet known to make them competitive on today's market.

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Mining Lead and Tiff

The Eldon Mining Co. has leases on 900 acres of land southeast of Mount Pleasant, Mo., and plans to mine and mill 300 tons of lead and tiff per eight-hour shift. Tiff is a common name for calcite in the Wisconsin and Missouri zinc fields.

Bethlehem Buys Lime Tract

Purchase of a large tract of land in Jefferson County, W. Va., and the optioning of other tracts in Jefferson and Berkeley Counties, has been announced by the Bethlehem Limestone Co., a subsidiary of the Bethlehem Steel Corp. An official of the company said the purchase was made and the options obtained in line with Bethlehem's policy of acquiring reserves of metallurgical limestone. It was emphasized that these acquisitions do not mean any immediate start of quarrying operations.

An exploratory drilling operation is now being carried out to determine the extent of the limestone deposits which will not be worked for several years. This is the first limestone land ever acquired by Bethlehem in the state.

Brazilian Ore Project

Authorization of an Export-Import Bank loan of up to \$67,500,000 and signing of a Defense Materials Procurement Agency purchase contract, involving the production of 5,500,000 tons of high-grade manganese ore from new deposits in Brazil, one of the largest projects of its kind ever undertaken, were announced recently in Washington and in Rio de Janeiro.

The project is to be undertaken by Industria e Comercio de Minerios, S. A., (ICOMI) of Rio de Janeiro, a Brazilian corporation in which the Bethlehem Steel Co. holds partial stock interest. Approximately \$4,000,000 has already been invested in exploration and other preparatory work at the mine site.

E & F Personnel Changes

Assignment of new responsibilities to five members of field management in the Eastern Gas and Fuel Associates mining organization were announced by H. John Harper, general manager of Eastern's mines. All were effective February 1.

A. P. Boxley, Beckley, manager, High Volatile division, was transferred to the Pittsburgh offices where he will become production manager for all mines. W. D. Hawley, Glen White, general superintendent, Low Volatile division, replaced Boxley as division manager in the High Volatile division. His offices will remain at Glen White.

The position of general superintendent

was eliminated from the organization and officials now acting in that capacity will be transferred to other duties.

E. H. Shaw, Kimball, general superintendent, McDowell County mines, and J. S. Wells, general superintendent, Boone and Wyoming County mines in West Virginia and the Weeksbury mine in Kentucky, are now production engineers in the offices of division managers. Shaw will be associated with H. A. Quenon, manager Low Volatile division, and Wells with W. D. Hawley in the High Volatile division.

W. W. Hunter, general superintendent, Fayette County mines, will be assigned to special duties under A. P. Boxley.

Reynolds Buys Bauxite Mine

All the assets of Berbice Co., Ltd., British Guiana subsidiary of American Cyanamid Co., have been purchased by the Reynolds Metals Co., according to R. S. Reynolds, Jr., president. The property includes the plants, machinery and transportation equipment used in mining bauxite at the British Guiana operation. About 20,000 tons of bauxite a month have been produced at the mine. The sale also includes a mining camp which will accommodate 600 persons.

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Move Calumet & Hecla Office

Endicott R. Lovell, president of Calumet & Hecla, Inc., announced recently that the company is planning to move its executive offices from Boston to Chicago. The move is designed to locate the company's headquarters at the geographical center of its present and future operations.

Stockholder and director meetings will continue to be held in Boston. The firm's metal sales and procurement departments will continue to operate from its New York office.

Drilling Air Hole

Uniontown mine of the Stony Point Coal Co. is to have a new air shaft. A 30-in. hole is being drilled by the General Geophysical Co. to the No. 9 seam of coal. The shaft will also serve as an emergency escape way.

Florida Mineral Tract Acquired

National Lead Co. has purchased a large plot of mineral-bearing lands south and east of Jacksonville, Fla. The tract adjoins properties from which the firm now mines sands bearing ilmenite, rutile, monazite, zircon and other minerals.

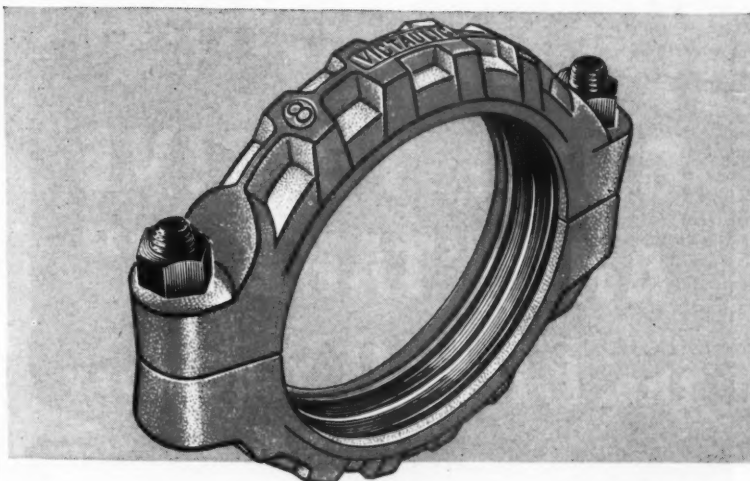
Describe New Mining Method

Development of a system known as "longhole retreat mining," designed for mining anthracite coal in beds pitching 70 to 90°, is the latest step in a number of long-range experiments undertaken by the U. S. Bureau of Mines to improve mining methods and aid the "hard coal" industry. The new system, described in a recent report, helps reduce costs and conserves anthracite as a natural resource.







Experiments on the longhole retreat method were made by the staff of the Bureau's Anthracite Research Laboratory at Schuylkill Haven, Pa., in co-operation with one of the large anthracite-producing companies. The actual tests, however, were conducted in a colliery in the coal fields and not in the laboratory.

Results of using this longhole method in a steeply pitched anthracite bed show an over-all high production rate combined with low cost, little use of explosives and timber, a high percentage of coal recovery, and an exceptionally clean product as well as an increase in the size of the coal pieces. Under this method, the report discloses, the miners' work is easier and safer.

During the longhole retreat experiments, 3500 tons of coal were recovered in 153 shifts of two men each, giving an average output of 11.4 tons per manshift, according to the Bureau's report. This compares with 6.13 tons per manshift for other underground employees at this mine which



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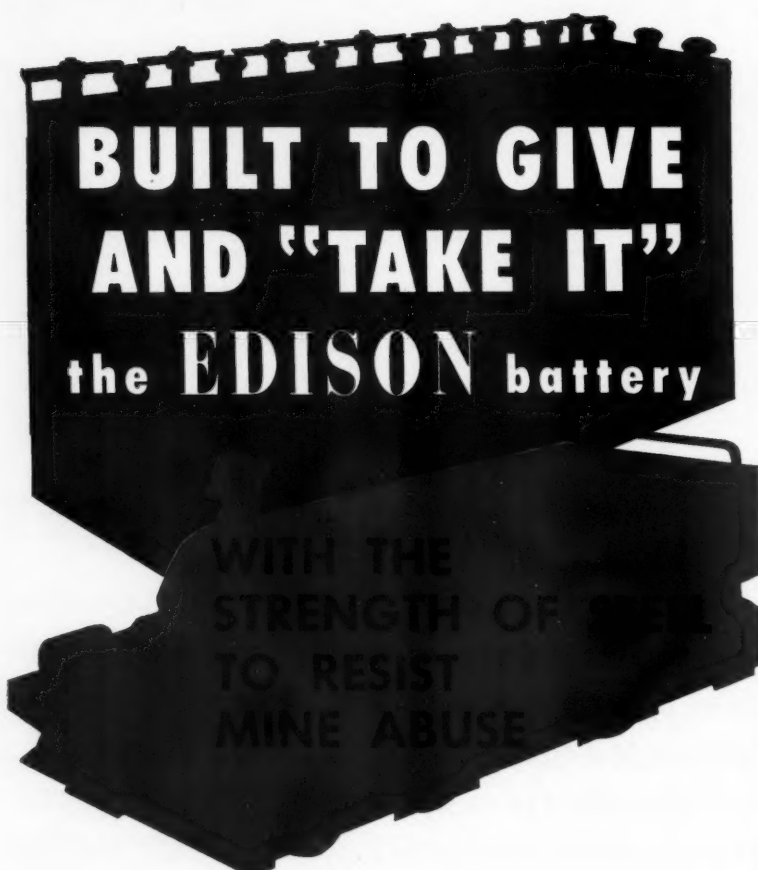


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has one of the highest production rates in the anthracite region.

The report of this investigation was prepared by Andrew Allan, Jr., a Bureau engineer stationed at Schuylkill Haven, Pa., and Russell S. Davies, superintendent of the Philadelphia & Reading Coal & Iron Co.'s Newkirk Colliery, Tamaqua, Pa. Results have been so encouraging that full-scale tests are planned on a variation of this method in the near future at the same colliery, it was announced.

A free copy of Investigations 4925, "Anthracite Mechanical Mining Investigations, Progress Report 7. Long-hole Retreat Mining of a Steeply Pitching Anthracite Bed," may be obtained from the Bureau of Mines, Publications-Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

BOOK REVIEW

1952 BITUMINOUS COAL ANNUAL, *Bituminous Coal Institute, Washington, D. C.* 176 pages. Single copy \$1.35.

COPIES of the 1952 edition of its *Bituminous Coal Annual*, the fifth in a series, are being distributed by the Bituminous Coal Institute, public relations department of National Coal Association.

The new volume "records the progress of the industry in terms of improved efficiency and safety in mining, betterments in coal utilization, new uses and ever-widening markets, and the bright horizon for coal in the years ahead.

Some of the basic data contained in previous *Annals*, is brought up to date in the '52 book, along with much new statistical material. The book begins with "Report of 1951-1952 in the Bituminous Coal Industry." Then a series of stories about the states which are "richly endowed with coal" is introduced as a new feature of the 1952 *Annual*. West Virginia, Pennsylvania, Kentucky, Illinois, Ohio, Virginia, Indiana, Alabama, Utah, and Tennessee are each treated separately. Colorado and Wyoming are discussed together as are Arkansas, Iowa, Kansas, Missouri, and Oklahoma.

Another innovation is a special 16-page pictorial supplement showing typical scenes of modern mechanized mining operations, coal preparation plants, and coal at work.

Still another new feature is a folded insert, "Cutaway View of a Typical Modern Underground Coal Mine," tracing step-by-step operations in the mining and preparation of coal.

Statistical tables, graphs, and charts complete the reference-type information. Another section describes the manifold activities of the National Coal Association, BCI's parent organization. The new book is completely indexed.



Western States

Silver Summit Hoist

A new hoist is being installed at the Silver Summit mine near Wallace, Idaho. The new hoist is being installed on the opposite side of the shaft from the old one so the change-over can be effected with a minimum of interference with production. Designed for a maximum of 800 hp, the hoist has been under construction at the Coeur d'Alene Hardware & Foundry Co. shops for several months.

A-Ore Pilot Plant

The Atomic Energy Commission and the American Cyanamid Co. in a joint announcement have disclosed that construction is under way on a pilot plant in Grand Junction, Colo., to demonstrate new and cheaper methods of extracting uranium. The plant, while small, will aim at testing methods of reducing costs of milling uranium ores. Metallurgical procedures which have been "more or less proven" on a laboratory experiment basis at the Raw Materials Development Laboratory of the Commission at Winchester, Mass., (formerly located at Watertown, Mass.), are scheduled to be carried out at the plant. The Winchester laboratory is operated by American Cyanamid Co.

Beat Tunnel Record

Drilling crews at the Aluminum Co. of Canada project at Kemano, B. C., have broken their own world record for tunneling. A crew blasted through 274 ft of solid rock for an average of 45.7 ft a day to break their previous record by 16 ft.

Placer Plant Reconditioned

The West America Tungsten Corp. has acquired the Cole and Swift tungsten placer washing plant at Atolia, Calif. West America has overhauled, rebuilt and placed the plant in operation to treat gold and tungsten placer gravel from several company controlled properties.

The company has leases on the Blackhawk Tungsten Mining Corp. claims located adjacent to the Union No. 1 shaft of the Surcease Mining Co. in the Atolia district. It also has leases on the Stevens property located

immediately north of the Union No. 1, as well as on the Good Luck No. 1 and No. 2 claims, which they have leased from Surcease, and a number of unpatented claims in the vicinity acquired by Cole and Swift.

CF&I Gets Roebling

The Colorado Fuel & Iron Corp., the nation's ninth largest steel producer, has completed the acquisition of the plants, inventories and business of John A. Roebling's Sons Co., Trenton, N. J., it was announced by Charles Allen, Jr., chairman of Colorado Fuel & Iron. The Roebling properties will be operated by John A. Roebling's Sons Corp., a newly formed and wholly owned subsidiary of Colorado Fuel & Iron.

Ruth in Production by Mid '54

J. C. Kinnear, Jr., general manager of Kennecott Copper Corp., reports that the deep mine project at Ruth, Nev., is estimated to be in production by mid 1954. The main Ruth shaft is being sunk to a depth of approximately 1500 ft while the adjacent inclined Kellinske shaft will be sunk to approximately 2200 ft. Ore will be removed on three levels of the main shaft, and daily production is expected to average 8000 tons. Estimated life of the project is 10 years.

New Uranium Mills

Plans for two new additional uranium mills to process uranium ore from the Colorado Plateau were discussed in Grand Junction, Colo., recently by Jesse C. Johnson, Director of the Division of Raw Materials of the AEC. He said the mills would be at Hite, Utah, and Shiprock, N. M., with construction scheduled to begin early in 1953. Another plant is currently under construction at Grants, N. M., by Anaconda Copper Mining Co. The two new mills, to be built by private companies, will be designed to process ore mined in southern Utah, northern New Mexico and Arizona.

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Metal and Nonmetallic Mineral Mining Convention

Scheduled for Seattle, September 21-23

WHEN members of the American Mining Congress meet in Seattle, Wash., next September for the Western Division's 1953 Metal and Non-metallic Mineral Mining Convention, it will be the first time this important cross-roads city of the Pacific Northwest will act as host to the group. Plans are already under way, directed by Robert M. Hardy, president of Sunshine Mining Co., who was elected Chairman of the Western Division at Denver last September.

In addition to his post as president of the country's greatest silver mine, "Bob" Hardy is a banker, construction engineer, industrialist, and yachtsman. He is one of the West's foremost proponents of modernization in metal mining. Under the direction of so able a chairman the 1953 Convention cannot help being one of the most successful such gatherings ever held.

There will be many new problems in national affairs to discuss as well as new approaches to matters in Washington that have concerned the industry for many years. However, in the clearer atmosphere of the new administration, mining men should be able to devote more time to increasing production and reducing costs through the application of the latest tools, methods and techniques. The whole program will reflect the impetus which



Robert M. Hardy
Chairman, Western Division

the "New Deal" has given to the mining industry.

This first meeting of the American Mining Congress at Seattle will undoubtedly draw a heavy attendance. Members of the Seattle Hotel Association have promised a quota of rooms calculated to meet this demand, but it will be advisable to fill out and mail the application blanks for reservations as soon as they are received. These will be mailed to the industry in February, and should be returned as soon as possible to the Housing Committee, Seattle Hotels Association, 315 Seneca St., Seattle, Wash.

Ready New Copper Mine

Copper Cities Mining Co., Miami, Ariz., is removing the overburden from its copper deposit at the rate of 500,000 tons monthly, and preparing roads, foundations, and other facilities. A crew of close to 190 men is employed in the work with operations on a three-shift basis.

The Copper Cities open-pit mine is scheduled for production late in 1954 and will replace the Castle Dome Copper Co.'s production when that ore body is exhausted. Both companies are wholly owned subsidiaries of Miami Copper Co.

Development of the Copper Cities mine was made possible by an RFC loan, together with a purchase agreement with Defense Materials Procurement Agency. Under the agreement with DMPA, Copper Cities was guaranteed a market for up to 170,000,000 lb of the first 192,500,000 lb of copper produced, at a price of 23 cents a

pound, provided the company cannot sell it to other purchasers in the United States at a higher price. Approximately one-half of the estimated cost of the project is being financed by the RFC loan.

Lignite in South Dakota

State Mine Inspector George B. Easton in his annual report stated that North Dakota's lignite coal mines yielded a total production of 3,160,676 tons, valued at \$7,874,712, in the fiscal year ended last June 30. This amount is 120,171 tons below the total for the preceding year. Eighty-nine mines were active, compared to 99 the previous year. These mines employed 675 persons, compared with 644 in the preceding year.

According to Easton, the state's mining industry produced a stellar safety record with no fatal accidents last year while working over a million man-hours.

Durango Expansion Planned

Plans for increasing tonnage capacity by 30 percent in uranium and vanadium at the Durango plant of Vanadium Corp. of America have been disclosed by D. W. Viles, vice-president of VCA. The necessary equipment will be added to the plant to handle additional ore and "special ore" from the Naturite, Colo., area. This is the second expansion move since VCA took over the Durango plant in 1948. The first expansion move increased production facilities by 80 percent. The plant was formerly operated by the American Smelting and Refining Co., but was closed for 20 years after metal mining in southwestern Colorado declined.

Soda Springs Plant Operating

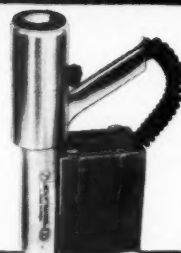
An elemental phosphorous plant has been placed in operation two miles north of Soda Springs, Idaho, by the Monsanto Chemical Co., according to John E. Gurvin, resident manager. The plant includes the largest electric furnace ever built. The company, sixth largest chemical company in the world and first in the production of elemental phosphorous, started work on the plant July 1, 1951, and completed it 17 months later.

During the summer, ore from the company's strip mine, 20 miles to the north, had been stockpiled preparatory to the opening of the mill.

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PRECISION RADIATION INSTRUMENTS

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Carlsbad a Busy Place

A spokesman for the American Potash Chemical Corp., Los Angeles, has been reported as saying that the firm plans drilling operations about 40 miles east of Carlsbad, N. M. If the company finds satisfactory potash deposits, it may begin mining operations. This would bring to six the number of companies producing potash in the area. A seventh company already is prospecting near Carlsbad.

Use Wyoming Phosphate

Kilns of the Phosphate Mines, Inc., at Susie, Wyo., are now operating with phosphate from a deposit at Leefe, north of Kemmerer, Wyo., and trona from the Westvaco deposits near Green River, Wyo. A group representing stockholders were on hand in mid-December to watch the beginning of operations at the plant which will produce phosphate fertilizer mixed with trona.

Unwater King of Pine Creek

The Hypotheek Mining and Milling Co., Wallace, Idaho, has begun unwatering the old King of Pine Creek shaft.

Meanwhile, two work projects are under way in the old King of Pine Creek north surface tunnel. A raise on a short oreshoot, up 26 ft, shows a vein containing some good lead-zinc ore, according to a company official.

Add to Potash Plant

International Minerals & Chemical Corp. plans a substantial addition to its sulphate of potash facilities at Carlsbad, N. M., according to A. Norman Into, vice-president in charge of International's Potash Division.

"The site of the new plant has been laid out already and construction will start without delay, probably within the next few months," Into stated. "The plant will be in production around the beginning of 1954. The added production resulting from this expansion will amount to approximately 35,000 tons of sulphate of potash a year," he added.

"Need for the new plant was dictated by agricultural demand, which has never been entirely satisfied. Our planned additional facilities will help to make the United States independent of foreign imports of sulphate of potash," Into said.

Completing Fluorspar Mill

The Arizona Eastern Fluorspar Corp. is making arrangements to place its three properties on a production basis. The mines are the Lone Star, 15 miles southwest of Benson, Ariz., and the Sydney and Polly Ann, 16 miles north of Duncan.

Ores from the three properties will be milled in a plant now under construction 2½ miles northwest of Duncan. The mill will have a capacity of 75 tons per 24 hours, and will consist of crushers, ball mill, classifier, settling tank, and flotation units.

The Lone Star is expected to produce from 15 to 20 daily, and the Sydney and Polly Ann from 35 to 45 tons daily.

Morris Albertoli is superintendent of mining operations and Cooper Shapley is in charge of mill construc-

tion. The corporation, which is a consolidation of three companies, is headed by Leo A. Deatrich of Culver City, Calif.

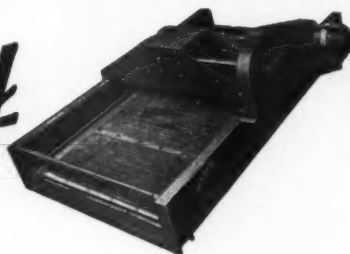
Alaska Indexed

Release of a new index map of Alaska, which should prove of great assistance to those interested in the discovery and development of the mineral resources of the Territory, was recently announced.

Compiled by E. H. Cobb, geologist,

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The Leahy No-Blind Vibrating Screen has been engineered for days and weeks of full capacity production in wet or dry screening. At its best in the fine mesh field, the Leahy offers Differential Vibration that clears the mesh of intermediate size wedging particles, 1600 times per minute.

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
Fort Wayne, Ind., U.S.A.

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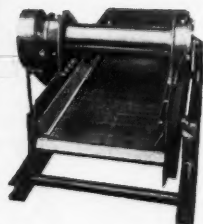
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as an index to reports published by the Geological Survey, the map will help the user to determine what principal publications describe the area in which he is interested and the location and extent of the area covered by the geologic map of each publication.

The index map may be obtained free upon application to the Geological Survey, Washington 25, D. C.; Room 100, Old Mint Building, San Francisco 3, Calif.; Box 1088, Fairbanks, Alaska; or Box 2659, Juneau, Alaska.

Idaho Goldfields Explores

A diamond drilling program which brought very good results has been completed at Idaho Goldfields, Inc., property, just east of the Fourth of July Canyon tunnel in Kootenai County, Idaho, according to James W. Milne, secretary. Development work on the property includes a shaft sunk to 30 ft and a tunnel which is in 145 ft. Short drill holes were made from the bottom of the shaft and the tunnel floor. Drilling totaled about 240 ft, with the longest hole approximately 45 ft deep.

Uranium Bonuses

Almost \$1,000,000 have been paid in uranium production bonuses to small operators on the Colorado Plateau, according to Atomic Energy Commission officials. The bonuses, offered in January, 1951, have resulted in payments of from \$15,000 to \$35,000 to miners producing uranium in quantities up to 10,000 tons. Small mine operators were given the greatest amount of the incentive money, because the big outfits were already established and were mining uranium when the bonus was first offered.

Mining Company Changes Name

Central Eureka Mining Co., a gold mining firm with properties at Sutter Creek, Calif., proposes to change its name to Central Eureka Corp., according to its annual report. Operation of Central Eureka's Sutter Creek mine was shut down from August 30 to December 1 because of the cave-in of a portion of one of its mine shafts.

Clear Old Nighthawk Tunnel

Nighthawk Silver-Lead Mining Co. has done considerable rehabilitation work at its Kootenai County, Wash., mine at the north end of Hayden Lake. The old tunnel to the winze was cleaned out and reports verified as to the location of the vein structure. The winze was sunk on a vein mineralized with silver and lead values. Earlier development work was dropped in 1918 when financial backing was lost, and later there was considerable litigation over the property. There are two 300-ft shafts and the original plan was to crosscut between them.

Mill Lincoln Mine Tailings

Black Rock Mining Corp. is milling 500 tons of scheelite tailings at its Lincoln mine in the Tempiute district, 60 miles from Pioche, Nev. The plant formerly treated 750 tons of gold ore daily at the Northumberland mine, north of Tonopah, and was recently moved to the Lincoln tungsten property and equipped with new units.

Sunlight Gets Lease

A 20-year lease on 617 acres of government-owned phosphate land in the Boulder mining district near Maxville, Mont., has been granted to the Sunlight Mining Co. of Spokane, Wash.

Part of the leased land is covered by the 49 unpatented mining claims making up the Sunlight property. The Government withdrew the phosphate beds from mineral entry years ago and the company, therefore, had to obtain the lease before it could mine phosphate.

Riley Mine Reactivated

The Riley mine near Winnemucca, Nev., has been reactivated by the U. S. Vanadium Corp., a subsidiary of the Union Carbide & Carbon Chemical Corp. The Riley was an important producer of tungsten during World War II and contains large deposits of scheelite. Reopening and operation of the mine was announced recently by W. H. Kohler, field engineer for the company. Ore is sent to the corporation's Pine Creek concentrator near Bishop, Calif.

Revise Flow Sheet

The mill flotation circuit is being revised at the mill of the Sunshine Mining Co., Kellogg, Idaho, to obtain greater flexibility in marketing the output of silver, lead and copper. The firm has been turning out a bulk concentrate containing all three metals. It plans to produce a high grade silver-copper concentrate and an iron concentrate which will carry most of the lead.

Sulphur Ore Produced

Operating a mill and refining plant on a large sulphur deposit three miles from the Western Pacific Railroad, the Black Rock Desert Mineral Co. is reported producing 400 tons of agricultural grade sulphur daily. The property is located in the Devil's Corral area near Winnemucca, Nev., and covers 110 acres of patented mineral land. The ore body contains 5,000,000 tons of commercial grade sulphur ore. The deposit has been mined intermittently for more than 60 years, but only since the fall of 1950 on such a large scale.



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Naylor is the one lightweight pipe with the built-in strength and safety required for push-pull ventilating as well as pressure air lines in mining service. It's easy to handle and install, especially with Naylor's Wedge-Lock coupling. It's extra strong because the Naylor Lockseam Spiralweld structure provides a distinctive reinforcing truss which adds collapse strength necessary for push-pull service. Naylor pipe comes in sizes from 4 to 30 inches in diameter.

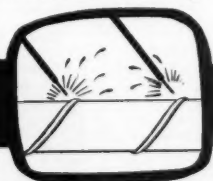
For full details, write for Bulletins No. 507, No. 513, and No. 514,

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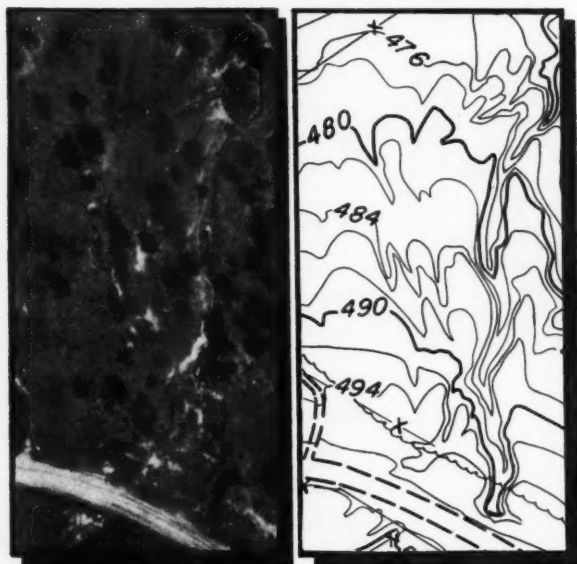
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Okay Polaris Agreement

At a December meeting in Wallace, Idaho, of the stockholders of Chester Mining Co., a development agreement with the Polaris Mining Co. was ratified. The agreement provides that Polaris will take over exploration and development of the six-claim Chester property in the silver belt for an interest in any ore that may be opened in Chester ground during the course of the work.

Lexington Silver-Lead Mines

Lexington Silver-Lead Mines, Inc., has encountered milling ore while drifting north on the Puck vein from the main adit of their mine near Neihart, Mont. The ore will be stockpiled and the mill started in the spring. Six men are currently working at the property, which will be operated all winter. Ore was encountered during drifting operations, and stoping is being done from the existing south drift on the adit level.

Nevada Miners Meet

The Nevada Mining Association held a meeting in Pioche, Nev., on January 15, 1953, and changed its name from the Nevada Mine Operators Association to the present one. Roy Hardy is president of the new association. First vice-president is John C. Kinnear, Jr., of Kennecott Copper Corp. and the second vice-president is Percy C. Dobson of Summit King Mines.

Two of the discussions held at the meeting concerned issuance of a semi-monthly letter covering labor markets and government items, and the establishment of a public relations program.



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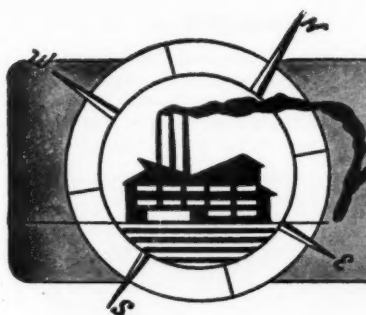
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INDUSTRIAL SCREENS **CFI**



Manufacturers Forum

Redesign Welder

A redesigned 300-amp ac welding transformer, featuring stepless current selection from 40 to 375 amp, has been announced by the General Electric Co.'s Welding Department.

The new welder, for practically all



applications from light-duty, low-current sheet metal work to heavier-duty, high-current industrial jobs, incorporates an enlarged scale and finely threaded screw adjustment to facilitate easy current selections. It accommodates electrodes from $\frac{3}{32}$ to $\frac{1}{4}$ in. diam, and has a handy range switch which enables the operator to change quickly from high to low or low to high range.

The new welder is built with studs at the base to simplify connecting electrode and work cables. Power-factor-correction capacitors assure low power costs. It is 36 in. high, 21 in. in diam, and weighs approximately 328 lb.

Freezeproof Coal

Winter shipments of coal destined for delivery in cold weather zones demand adequate preparation against hazards of freezing.

With proper protection, shipments will be unloaded on time at less cost, cars will not be damaged or held up, and demurrage will be kept to a minimum.

For years calcium chloride has been used as a successful material for protecting winter coal shipments from freezing in transit and in yards.

Brief CoB-1 "Freezeproofing Coal with Calcium Chloride" is a handy reference for use in preparing calcium chloride solutions; it is available

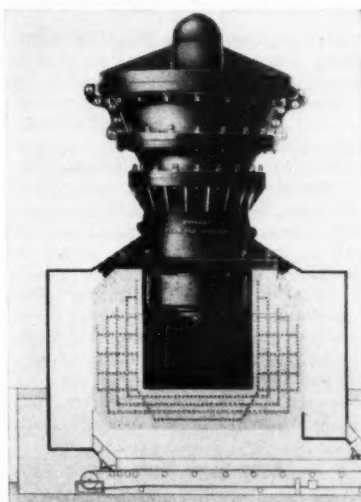
on request and it contains general instructions, procedures, equipment recommendations, and methods for preparing coal shipments in coldest weather. Write to Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C.

Design New Crusher

The new Kennedy-Van Saun Gyrotory crusher has been especially designed to eliminate the clogging of rock and ore in discharge bins. To facilitate this, two discharge outlets have been incorporated into the crushers, each at a 70° angle.

It is reported that the crusher handles limestone, trap rock, basalt, taconite, slag and other hard-to-crush rock and ore containing as high as 50 percent clay without clogging. New design has provided for a starting torque of 250 percent and a pull-out torque of 300 percent.

All moving parts are on self-align-

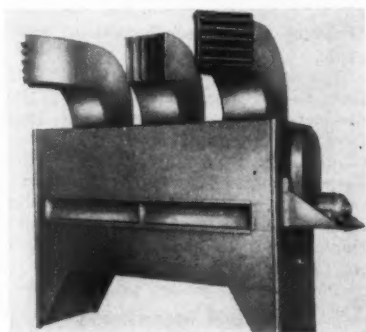


ing roller bearings and there is a recirculating forced-feed oiling system. An automatic power shut-off is provided in the event of oil pressure failure. Reduction to as fine as 1/16 in. is possible with the new crusher.

For further information write Kennedy-Van Saun Manufacturing & Engineering, 2 Park Ave., New York, N. Y.

Space Heaters

An improved line of industrial heaters is available from the Westinghouse Electric Corp. The self-contained units, which range from 100,000 to 2,500,000 Btu per hour in heating capacity and from 2000 to



25,000 cfm in air velocity, may be floor, wall or ceiling-mounted. They may be mounted in either upright or inverted position when wall-mounted.

For further information, write Westinghouse Sturtevant Division, Dept. T-535, 200 Readville Street, Hyde Park, Boston 36, Mass.

Improved Screen Heating

A new method of heating screen cloth by electricity to prevent clogging or "blinding" when wet materials are screened is announced by Hewitt-Robins Incorporated.

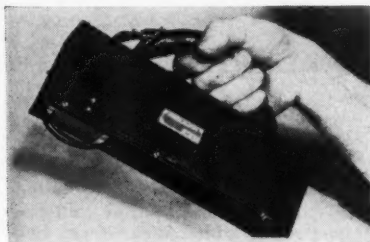
Electrical current is carried to the screen by short insulated cables attached to copper bars which are located under the screen cloth and make direct contact with it. Worn cloth can be replaced as easily as before addition of the heating equipment.

The new electrical arrangement eliminates power losses encountered in older systems where current is passed through steel or copper skirtboards along side the screen and above the screen cloth.

Current distribution bars are shielded from abrasive action of material being screened, thus preventing weak or broken contacts due to corrosion of steel or copper parts.

Prospecting Made Easier

Mineralight M-12, featured by the Radiac Company, Inc., 489 Fifth Ave., New York, is, according to the manufacturer, the only self-contained ultra-violet lamp on the market operating on 110 ac current derived from one six v battery. Prospectors, miners,



engineers or lobbyists use the Mineralight for locating uranium, oil, shale, tungsten, zirconium, mercury, thallium and other fluorescent minerals.

The M-12 Portable Ultra-Violet light can distinguish a mineral by its distinctive color response and thus save time in identification as well as eliminate costly assay charges. It has a built-in flashlight with a two-way switch for either white or ultra-violet light. The tube is of permanently efficient pure fused quartz. It will burn for 1500 or more hours of use.

Make Drill Improvements

An air-leg rock drill combination designed as a completely integrated unit is being offered by Ingersoll-Rand Co. Known as the JR-38 Jackdrill it has features not available in Jack-hammer air-leg combinations. The most radical innovation is a built-in air coupling between the drill and the



feed leg doing away with the third hose necessary in previous combinations.

Also, the control valve for feed leg pressure is built into the backhead of the drill where it is always convenient to the operator. In addition, the feed leg pressure can be shut off with the throttle valve which controls the operation of the drill. This feature eliminates feed leg pressure adjustment every time the drill is moved for another hole. The backhead is de-

signed so that flushing water is turned on when the throttle is opened.

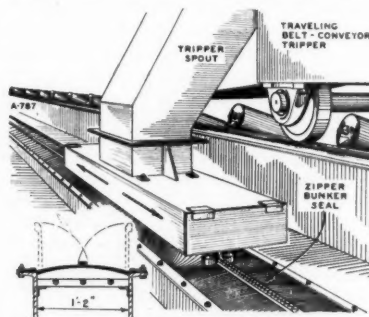
The universal Jackdrill can be used either as a drifter, stopper or Jackhammer. For Jackhammer use, the feed leg is detached from the drill by simply loosening the coupling nut and is ready for use without any further adjustment.

For additional information, contact any of the many Ingersoll-Rand branch offices located throughout the country or write to Ingersoll-Rand Co., Dept. RD, 11 Broadway, New York 4, N. Y.

Keep Dust In

The S-A Zipper Bunker Seal is designed to prevent dust from belt conveyor traveling tripper discharge spouts feeding bunkers. It consists of two zipper toothed seal belt strips and an opening and closing mechanism.

Flat belts are fastened to opposite edges of the bunker opening, their



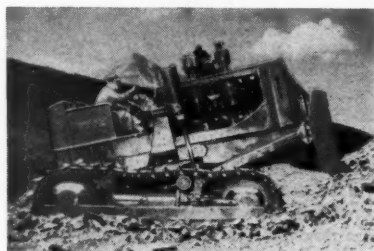
zipper toothed edges meshing tightly along the centerline to form a dust-proof connection. The reversible belt operating mechanism hangs from the tripper spout, with rollers at each end spreading the teeth for easy opening or closing, depending on the direction of travel. Rollers are mounted on pantograph frames to maintain proper belt contact at all times. Since the belt is open only directly under the discharge point, dust cannot escape. A metal shield on the tripper chute completes the seal. Additional horsepower required to operate the Zipper Bunker Seal is less than 0.2 for typical tripper speeds. For further information write Stephens-Adamson Mfg. Co. at Aurora, Ill., Los Angeles, Calif.

Keep Spark Plugs Dry

The new activated Spar-Kover manufactured by Lucas Products Co., North Canton, Ohio, protects spark plugs from shorting out. The special ceramic cartridge absorbs moisture and condensation around plugs and the water tight cover protects plugs from dew, fog and splashing water. Spar-Kovers are available for all spark plugs and can be used on any type of ignition fired engines.

Improve Bulldozer

Following successful development of the earthmoving industry's first big "no pushbeam" bulldozer, the 9X, The Baker Manufacturing Co., Springfield, Ill., announces production of the

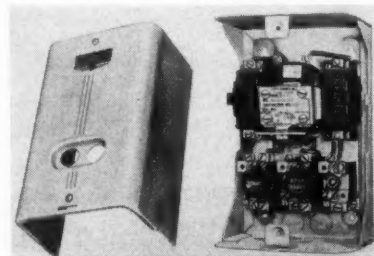


bigger, more powerful, new Baker 15X, which puts more horsepower than ever to work on the 'dozer blade. Developed in cooperation with Allis-Chalmers, the new 15X mounts on the A-C HD-15 Tractor, and features integral tractor-dozzer construction; legal highway portability (without permits)—only 96 in. wide; big yardage capacity—51-in. high moldboard; 39½-in. blade rise and 15½-in. drop below ground; greater track oscillation; center of gravity permitting draw bar work with dozer mounted; operator-ease control; design for easy servicing, and less weight—lower cost.

Announce New Line of Starters

Announcement is made by Cutler-Hammer, Inc., 312 N. 12th Street, Milwaukee 1, Wis., of a new line of magnetic starters, contactors and relays.

This new line incorporates a simple five-unit construction designed to install easier, work better, last longer. A wrap-around cover pulls off, fully



exposing the front and both sides of the unit for 180° accessibility. The five independent parts consist of two contact blocks, a magnet coil, an armature and a three-coil or two-coil overload relay mounted on a steel panel. Each part can be removed from the front without disturbing another part.

All terminals are angled to face front, and are equipped with solderless connectors that take a vice-grip on solid or stranded wire, or both . . . or wire of different sizes.

Reduce Down Times

Stainless steel helical-wire thread inserts are reducing equipment downtime wherever machine operations are impaired by stripped or worn threaded holes.

Time and cost savings up to 80 percent have been reported when comparing the wire insert method of thread repair with previous methods. In addition, Heli-Coil thread inserts provide higher loading strengths in all materials and are more resistant to wear, vibration, seizing, galling and corrosion than original threads.

Heli-Coil thread inserts are manufactured by Heli-Coil Corp., 1271 Shelter Rock Lane, Danbury, Conn.

Speed Belt Repairs

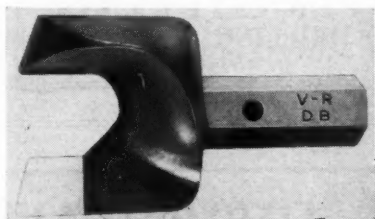
A new and improved design of drive-on conveyor belt fastener is now available. It makes possible a tight, quick and easy method of repairing and joining conveyor belts according to the manufacturer. Gaping openings in the belt between the plates are eliminated. It is not necessary to pre-punch holes to guide the teeth.

A mechanic's hammer is all that is required to apply. Repairs and joints can be made instantly, right on the job by anyone who can wield a hammer.

The fastener is made for repairing rips in conveyor belts $\frac{1}{8}$ in. to $\frac{1}{4}$ in. thick and for joining medium duty conveyor belts $\frac{3}{16}$ in. to $\frac{1}{2}$ in. thick. Flexible Steel Lacing Co., 4607 Lexington Street, Chicago 44, Ill.

New Drill Bit

"Three times longer life between grinds" is the report from users of the new carbide tipped auger drill head. Used in both post-mounted and hand-held drilling, this new line of



Vascoloy-Ramet bits, Style DB, depart in tip design from the ordinary type auger heads.

Style DB auger drill bits are made from the finest grade of Vascoloy-Ramet Tungsten Carbide and are available in sizes from 1 $\frac{1}{8}$ in. to 3 in. in diam with either standard hexagon or square shanks and are priced the same as regular style auger drill bits. For added information write Vascoloy-Ramet Corp., Waukegan, Ill.

— Announcements —

The Osmose Wood Preserving Co. of America has moved into new and larger headquarters. Their address is now 980 Ellicott St., Buffalo 9, N. Y.

The Defense Materials Procurement Agency has recently negotiated a contract with Southwestern Engineering Co. of Los Angeles for the analysis and testing of a series of metallurgical samples in the Los Angeles laboratories. According to Herbert Hughes, Industrial Division Manager of Southwestern Engineering Co., DMPA will submit a number of samples from deposits in the Virginia, Arkansas and Appalachian regions for testing and reports.

George C. Holton has been appointed manager of the Explosives Department of the American Cyanamid Co.,



George Holton

it was announced by S. C. Moody, Cyanamid vice-president and general manager of Calco Chemical Division. Holton was for many years assistant manager under R. E. Wiley, who will continue to act as consultant on matters pertaining to explosives. Holton has been with the company since 1933, when the General Explosives Corp. was purchased by American Cyanamid Co.

John W. Allis, vice-president of The Louis Allis Co., announced that Louis Allis, Jr., formerly vice-president in charge of sales, has been elected a vice-president of the company. C. G. Skidmore, formerly sales manager of the company, was elected an officer of the company as vice-president in charge of sales. He also will perform the function of general sales manager.

The Industrial Division of Gould-National Batteries, Inc., is soon to start production in a new \$3,000,000 factory at Kankakee, Ill.

William F. Koch, manager of sales in the Salt Lake City, Utah, office of Hercules Powder Co. for the past 22 years, retired December 31. L. W. Ben Early, assistant manager since 1949, succeeded Koch as manager.

Several personnel appointments in National Mine Service Co. have been announced by Gordon MacVean, president. W. C. Campbell has been named sales assistant to the president; J. E. Ward has been made district sales manager for the Whiteman Division and the Anthracite Division; Robert Yaple has been appointed district sales manager for the Bemeco Division, Beckley, W. Va., the All-State

Division, Logan, W. Va., and the Kentucky-Virginia Division, Jenkins, Ky.; F. M. Gates will replace Yaple as manager of warehouse sales of the Bemeco Division.

Newcomer Products, Inc., Latrobe, Pa., announces it has streamlined its Mining Tool Sales Distribution. All customers are being serviced directly by the company, instead of through jobbers and suppliers.

CATALOGS AND BULLETINS

GUIDE TO CENTRIFUGAL PUMP SELECTION. *Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.* In addition to covering general purpose, double suction, multi-stage, special purpose, marine and mixed and axial flow pumps, this bulletin has a head-capacity table for single stage, double suction Allis-Chalmers pumps. Request Bulletin No. 52C6059J from Allis-Chalmers Manufacturing Co., 972 S. 70th St., Milwaukee Wis.

HARD-FACING GUIDEBOOK. *Stoddy Co., Whittier, Calif.* A complete revision of the booklet, "Stoddy Hard-Facing Guidebook." It describes rebuilding and hard-facing of all types of heavy equipment used in earth-moving, mining, lumbering, cement and allied industries. The guidebook is obtainable through Stoddy dealers or on request to the company.

HEAD LOSS DATA ON PLASTIC PIPE. *Carlson Products Corp.* announced that authoritative data has been compiled on head loss due to friction in Carlson plastic pipe and is available in the form of charts and graphs. These are based on a combination of Carlson's own experience and a compilation of data derived from a thorough check of flow properties by hydraulic laboratories throughout the country.

Head loss data on Carlson will be sent upon receipt of letterhead request or publication inquiry to E. S. Moreland, 10225 Meech Ave., Cleveland 5, Ohio.

MICROFILMING. *Remington Rand, Inc., 315 Fourth Ave., New York 10, N. Y.* A seven-point service for placing records permanently on microfilm is outlined in this catalog. This service provides for an analysis of records to determine which ones should be filmed. The bulletin, with complete information on complete microfilming service, can be secured by writing for BSD-5 to the above address.

USE AND CARE OF WIRE ROPE. *A. Leschen & Sons Rope Co., 5909 Kennerly Ave., St. Louis 12, Mo.* A guide to improved wire rope service, this booklet contains 72 pages of practical information on proper methods of handling, reeving, breaking in, splicing, cutting, lubricating, and specifying wire rope. Free copies are available from Dept. C-51, A. Leschen & Sons Rope Co., at the above address.

WILMOT-DANIELS HEAVY DENSITY SYSTEM. *Wilmot Engineering Co., Hazleton, Pa.* Bulletin HD-521 describes heavy density units for coal cleaning and ore concentration recently introduced by Wilmot. Well illustrated, it contains flow diagrams for various feeds as well as engineering and specification data for the mine standard sizes in which this equipment is furnished—50 to 800 tph.

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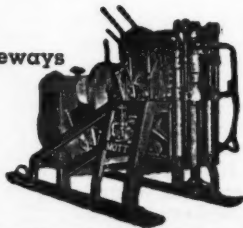
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Proper grinding of Carset Jackbits provides the maximum, maximum highest drilling efficiency and a long life on difficult jobs and equipment. The principles outlined in this chart for grinding are the key to "well hand" grinding.

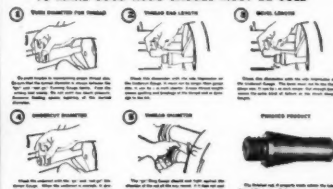


WHEEL RECOMMENDATIONS

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IMPORTANT THINGS TO WATCH When Threading Ingersoll-Rand 100 Series Jackrods

TO MAKE GOOD RODS GAUGES MUST BE USED



SOME HELPFUL HINTS

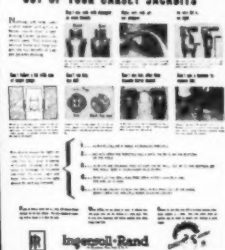
1. Do not use a rod that is bent or twisted. 2. Do not use a rod that is cracked or chipped. 3. Do not use a rod that is worn or damaged. 4. Do not use a rod that is rusty or corroded. 5. Do not use a rod that is painted or coated. 6. Do not use a rod that is oiled or greased. 7. Do not use a rod that is wet or damp. 8. Do not use a rod that is dry or hot. 9. Do not use a rod that is cold or frozen. 10. Do not use a rod that is too long or too short. 11. Do not use a rod that is too thick or too thin. 12. Do not use a rod that is too hard or too soft. 13. Do not use a rod that is too brittle or too tough. 14. Do not use a rod that is too smooth or too rough.

MEASURING DIMENSIONS

1. Measure the length of the rod. 2. Measure the diameter of the rod. 3. Measure the thickness of the rod. 4. Measure the width of the rod. 5. Measure the height of the rod. 6. Measure the depth of the rod. 7. Measure the area of the rod. 8. Measure the volume of the rod. 9. Measure the weight of the rod. 10. Measure the density of the rod. 11. Measure the specific gravity of the rod. 12. Measure the melting point of the rod. 13. Measure the boiling point of the rod. 14. Measure the freezing point of the rod.

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HOW TO GET THE MOST OUT OF YOUR CARSET JACKBITS



ROLLING THE UNDERCUT ON "100 SERIES" JACKRODS With the Ingersoll-Rand "JACKROLL" For Increased Attachment Strength

Rolling the undercut on the Ingersoll-Rand 100 Series Jackrod is a 14-step operation that will increase the life of the rod by 50% to 100%. The Jackroll is a special tool that is used to roll the undercut on the rod. The undercut is a small groove that is rolled into the rod. This groove increases the strength of the rod and prevents it from breaking. The Jackroll is a simple tool that can be used by anyone. It is a must-have for anyone who uses Ingersoll-Rand 100 Series Jackrods.

OPERATION No. 1

1. Place the rod in the Jackroll. 2. Turn the Jackroll. 3. Roll the undercut. 4. Check the undercut. 5. Repeat the operation. 6. Finish the undercut. 7. Remove the rod. 8. Inspect the rod. 9. Store the rod. 10. Use the rod. 11. Replace the rod. 12. Clean the rod. 13. Polish the rod. 14. Paint the rod.

OPERATION No. 2

1. Place the rod in the Jackroll. 2. Turn the Jackroll. 3. Roll the undercut. 4. Check the undercut. 5. Repeat the operation. 6. Finish the undercut. 7. Remove the rod. 8. Inspect the rod. 9. Store the rod. 10. Use the rod. 11. Replace the rod. 12. Clean the rod. 13. Polish the rod. 14. Paint the rod.

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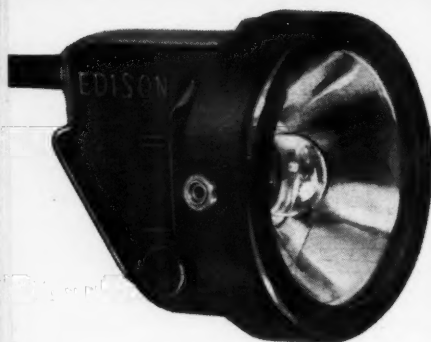
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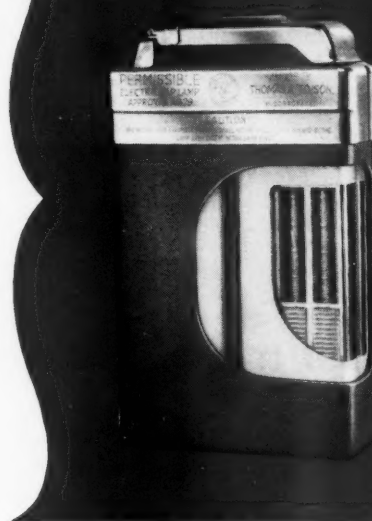


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